AMERICAN JOURNAL OF ORTHODONTICS

OFFICIAL PUBLICATION OF
THE AMERICAN ASSOCIATION OF ORTHODONTISTS,
ITS COMPONENT SOCIETIES, AND
THE AMERICAN BOARD OF ORTHODONTICS

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Vol. 47 MARCH, 1961 No. 3

developed especially for the "EDGEWISE TECHNIC"

Whitman
CONTOURED CUSPID and BICUSPID BANDS

- Practically self-fitting, designed to eliminate necessity of festooning interproximal edges.
- Shaped to bend parallel to the cut
- Eliminates "dogears" on cuspids .004" thick.

Whitman
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- Quicker, more accurate fit at gingival and incisal margins.
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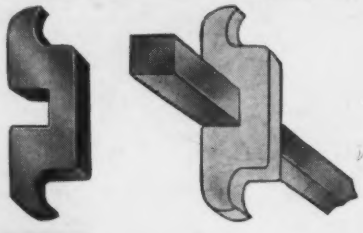
All bands available in highly tarnish-resistant precious metal alloy or Duro-Lus Stainless Steel, with or without brackets.



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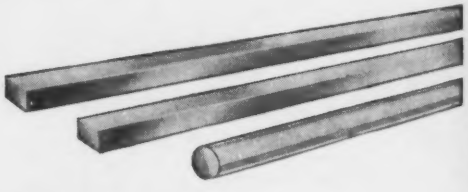
PRECISION BRACKETS

- Precision machined for perfect fit of .022" x .028" rectangular wire.
- High fusing metal, alloyed for extreme hardness and resistance to wear.
- Narrow (.050") or wide (.100").



WILLIAMS
ORTHODONTIC WIRES

- Size .022" x .028" to fit Williams Brackets. Also in .021" x .025" or .022" x .025". Also arch and spring wires in all gages.
- In precious metal alloy or Duro-Lus Stainless Steel.

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- Gauge insures uniform alignment of brackets.
- Seater insures accuracy of band heights.
- Burnisher is adaptable to all conformations.
- Surgical steel inserts, aluminum handle.

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Also Simplified Ordering Charts — All Technics.

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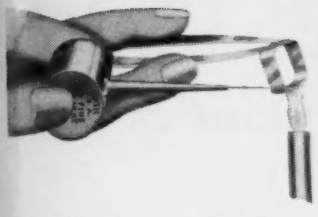

Baker Solders are named according to their fineness as stamped. They have unusual wetting properties, flow freely and form strong, dense, smooth joints without gaseous pits. Our solders are not brittle in wire form. They are packaged on spools of 5 dwts. to fit our spout containers. 28 gauge (.013"), 25 gauge (.018"), or very heavy 23 gauge (.022"). In 1 dwt. pieces, 1 dwt. narrow strips, 2 dwt. wide strips. 14K 450 Fine is a Universal Solder used for all types of connections on steel as well as precious metals. 18K 650 Fine is higher fusing. We list other Orthodontia Solders.

★ ★

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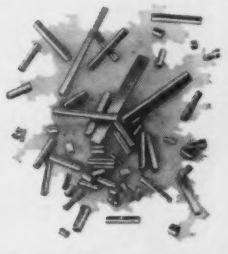


We supply Oralium tubes and tubing almost exclusively because of its hardness, non-stretching qualities and high fusing point. It does not oxidize and is low in cost. All Baker tubing is drawn to fit our wire precisely and is exceptionally smooth and uniform.

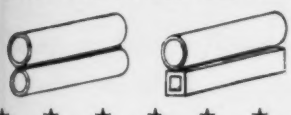
All round tubing has a wall thickness of .012".

All lingual tubes have a wall of .015".

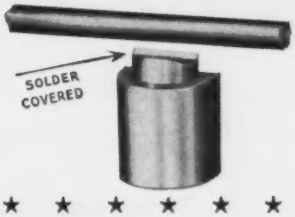
Always order half-round Oralium Tubes mounted on a straight piece of Q-A Post wire to insure fit.

D-SHAPE TUBES AND POSTS COME ON Q-A SEGMENTED WIRE TO FIT.

ALL COMBINATION DOUBLE HEADGEAR TUBES. SAVE CONSIDERABLE TIME.

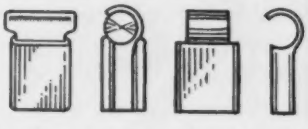


HALF-ROUND TUBES AND POSTS TUBES HAVE A SHEET OF SOLDER IN PLACE. POSTS ARE GROOVED OUT TO RECEIVE WIRE.



SYMMETRICAL D-SHAPE TUBE AND POST COLLAR SNAPS OVER ARCH WIRE AND IS PLACED IN PERFECT POSITION BEFORE SOLDERING. MADE TO FIT .036, .038, .040 ARCH WIRE.

EXTRA WIDTH OR REGULAR WIDTH



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★ ★

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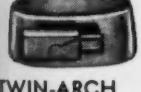

TWIN-ARCH TIE BRACKET

TWIN-ARCH SLIDE PIN ATTACHMENT

ANTERIOR EDGEWISE BRACKET

MOLAR EDGEWISE BRACKET

SIAMESE EDGEWISE BRACKET

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Vol. 47, No. 3, March, 1961. American Journal of Orthodontics is published monthly by The C. V. Mosby Company, 3207 Washington Blvd., St. Louis 3, Mo. Subscription rates: United States, its Possessions, and Canada $12.00; Latin America and Spain $13.00; Other Countries $13.50. Students and dentists on residency programs: United States, its Possessions, and Canada $7.20; Latin America and Spain $8.20; Other Countries $8.70. Single copies $2.00 postpaid. Second-class postage paid at St. Louis, Mo. Printed in the U. S. A.

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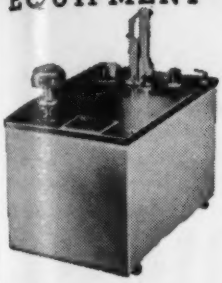
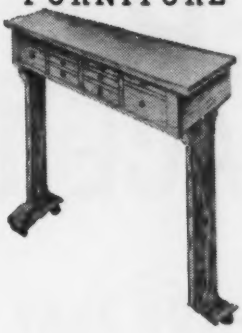
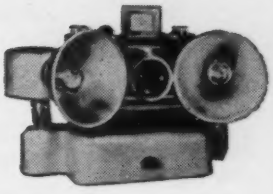


FURNITURE



OPERATING AIDS

PHOTOGRAPHY



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Dear Doctor:

Have you 5 minutes to look through the catalogue we sent you a few months ago? There are a number of items, exclusively ours, that will assist you in saving hours of "Chair Time."

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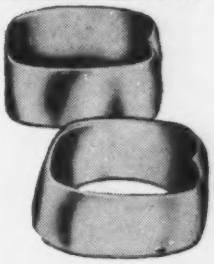
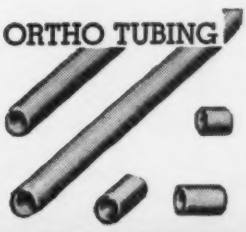
ORTHO WIRES

ATTACHMENTS

MOLAR BANDS



ORTHO TUBING



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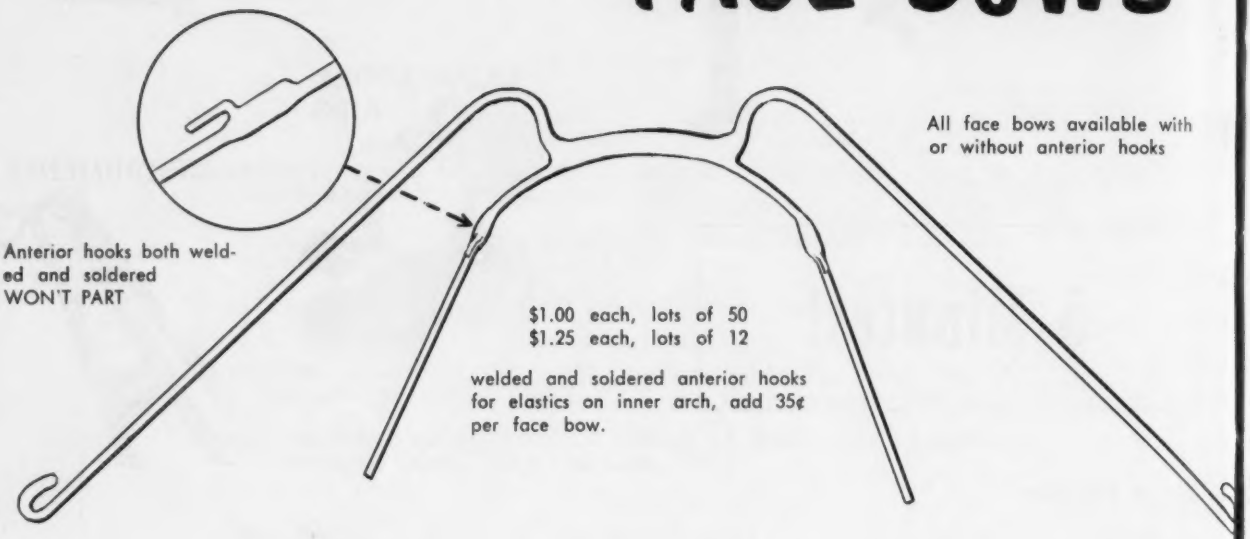
BETTA ORTHODONTIC SUPPLIES

. . presenting the

ASHER FACE BOWS



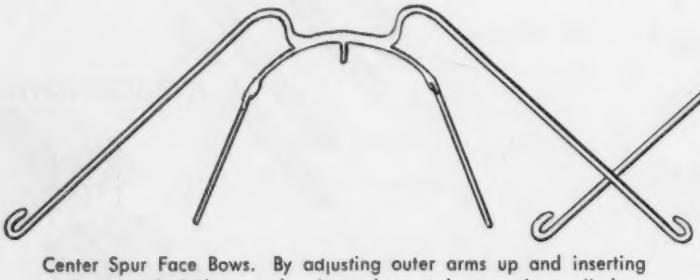
Anterior hooks both welded and soldered WON'T PART

All face bows available with or without anterior hooks

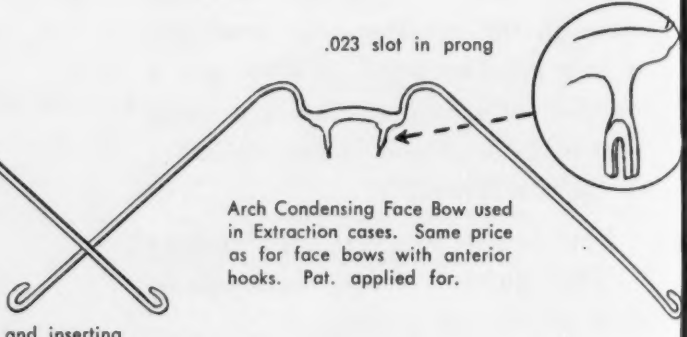
$1.00 each, lots of 50
$1.25 each, lots of 12

welded and soldered anterior hooks for elastics on inner arch, add 35¢ per face bow.

Face Bows can be assorted for quantity prices

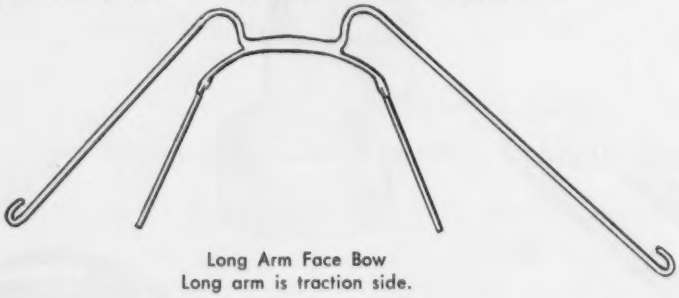


.023 slot in prong



Arch Condensing Face Bow used in Extraction cases. Same price as for face bows with anterior hooks. Pat. applied for.

Center Spur Face Bows. By adjusting outer arms up and inserting center spur incisal to arch wire, when neck strap is applied, a high pull incisor action will help correct deep overbites. By adjusting outer arms down and inserting center spur gingivally to the arch wire, a low pull incisor action will help correct open bites. Same price as for face bows with anterior hooks.



Long Arm Face Bow
Long arm is traction side.

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Outer arms .060" and .065"
Inner arches .044" or .050"
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PLAIN FACE BOWS—NO ANTERIOR HOOKS
.044 inner arch—.060 outer arms

P	.044 inner arch.
CS	.044 inner arch with center spur.
LA	.044 inner arch—one outer arm much longer. Longer arm is power side. No movement on short arm side.
SLA	.044 inner arch—one outer arm is ¼" shorter. Longer arm extended for power action. Most useful for average case, where retraction is necessary in both buccal segments, but a little more necessary on one side.
SE	.044 inner arch with ends of both outer .065 arms straight and one inch longer.
SE & CS	.044 inner arch same as above but with center spur.

FACE BOWS WITH WELDED AND SOLDERED ANTERIOR HOOKS
.044 inner arch—.060 outer arms

AH	.044 inner arch.
AH	.044 inner arch with center spur.
LA Left LA Right	.044 inner arch—one outer arm much longer. Longer arm is power side. No movement on short arm side.
SLA Left SLA Right	.044 inner arch—one outer arm is ¼" shorter. Longer arm extended for power action. Most useful for average case, where retraction is necessary on both buccal segments, but a little more on one side.
SE	.044 inner arch with ends of both outer .065 arms straight and one inch longer.
SE & CS	.044 inner arch same as above but with center spur.

PLAIN FACE BOWS—NO ANTERIOR HOOKS
.050 inner arch—.060 outer arms

150P	.050 inner arch.
151CS	.050 inner arch with center spur.
152LA	.050 inner arch—one outer arm much longer. Longer arm is power side. No movement on short arm side.
153SLA	.050 inner arch—one outer arm is ¼" shorter. Longer arm extended for power action. Most useful for average case, where retraction is necessary on both buccal segments, but a little more necessary on one side.
154SE	.050 inner arch with ends of both outer .065 arms straight and one inch longer.
155SE & CS	.050 inner arch same as above but with center spur.

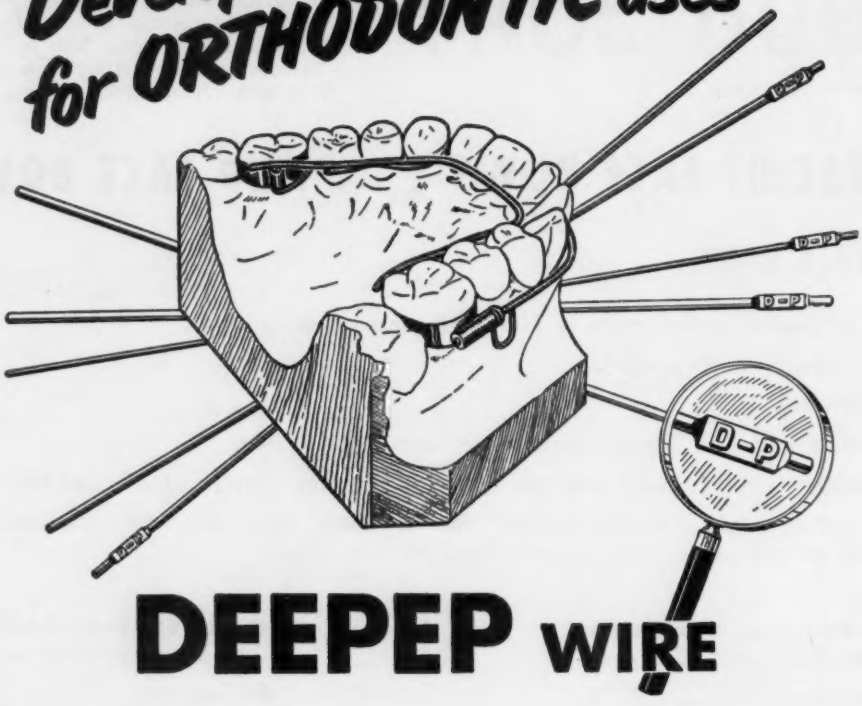
FACE BOWS WITH WELDED AND SOLDERED ANTERIOR HOOKS
.050 inner arch—.060 outer arms

250AH	.050 inner arch.
251CS	.050 inner arch with center spur.
252LA Left 253LA Right	.050 inner arch—one outer arm much longer. Longer arm is power side. No movement on short side.
254SLA Left 255SLA Right	.050 inner arch—one outer arm is ¼" shorter. Longer arm extended for power action. Most useful for average case, where retraction is necessary on both buccal segments, but a little more on one side.
256SE	.050 inner arch with ends of both outer .065 arms straight and one inch longer.
257SE & CS	.050 inner arch same as above but with center spur.

301 Arch condensing face bow. Two prongs with .023 slot, welded and soldered. WON'T PART. Used in extraction cases to close anterior spaces in either maxillary or mandibular arch. Outer arms .060

ALL FACE BOWS CAN BE ASSORTED FOR QUANTITY PRICE

Developed specially for ORTHODONTIC uses



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•

Deeortho Band Material

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Deeortho Buccal Tubes

•

Deeortho Half-Round Tubes

•

Dee Solder Wire

•

Information about these products furnished at your request.

This gold-platinum alloy combines stiffness with just enough flexibility for accurate workability and with sufficient "spring back" to function properly where this quality is needed. In addition, DEEPEP wire responds readily to heat treatment.

These qualities make DEEPEP wire very satisfactory for lingual arches, auxiliary springs, stop springs and stabilizers and it is widely used for these purposes. You have to use DEEPEP wire to appreciate its exceptionally fine working properties. Once you try it, we're confident you will continue to use it. Your dealer can supply you. Insist on stamped wire to be certain you're getting genuine Deepep.

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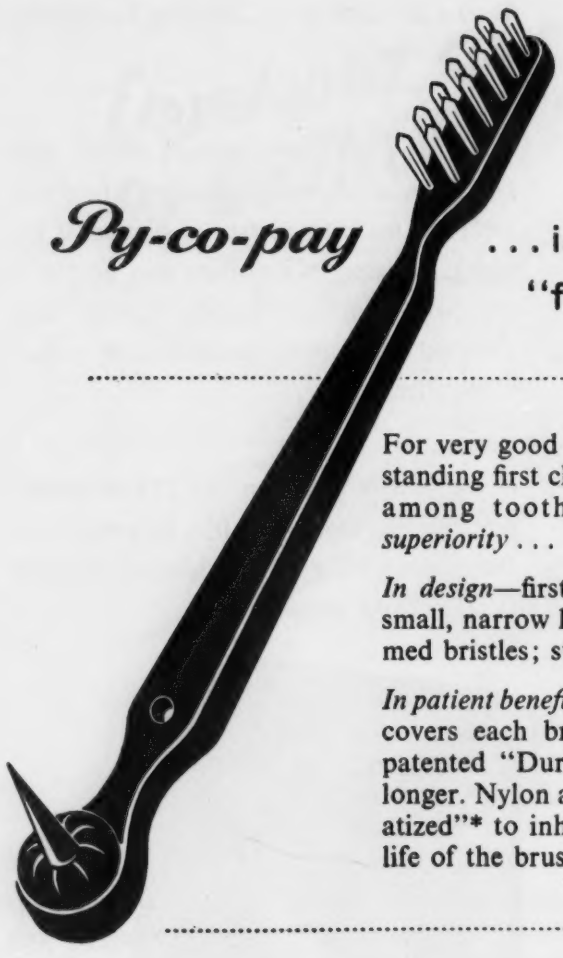

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For very good reason, Py-co-pay is the outstanding first choice of the dental profession among toothbrushes. That reason is *superiority* . . .

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*T.M.

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Jersey City 2, New Jersey

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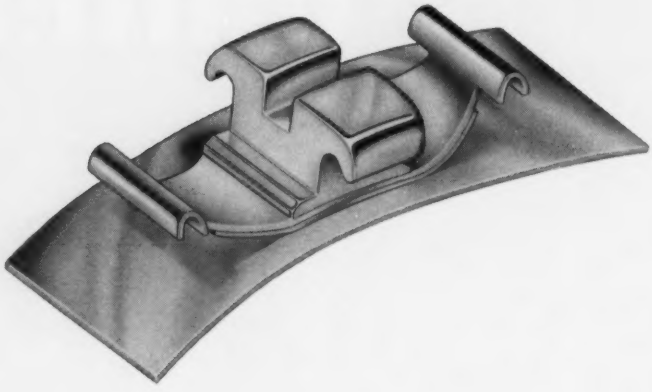
STEINER SPRING WING ROTATION BRACKET

NEW MEDIUM LENGTH



Another important first from Unitek. This time it's a highly resilient *spring wing* Rotation Bracket. This new Edgewise Bracket works continuously, delivering a variable, controlled force over a longer distance. Its smooth, multiple *spring leaf* elements store and deliver energy for positive, yet gentle action to rotate wayward teeth. Force for rotation can be delivered over a wide range.

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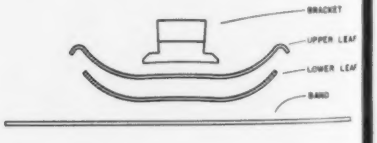
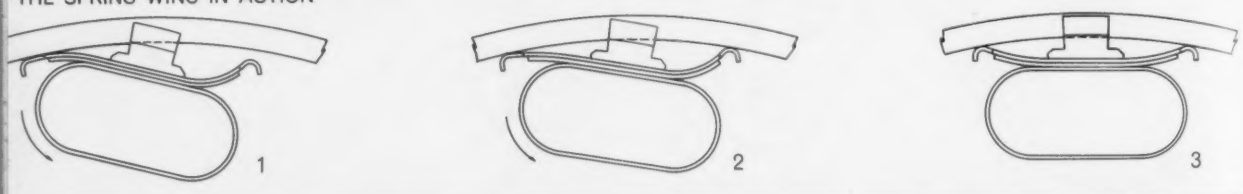
SPRING LEAF DESIGN



THE SPRING WING IN ACTION



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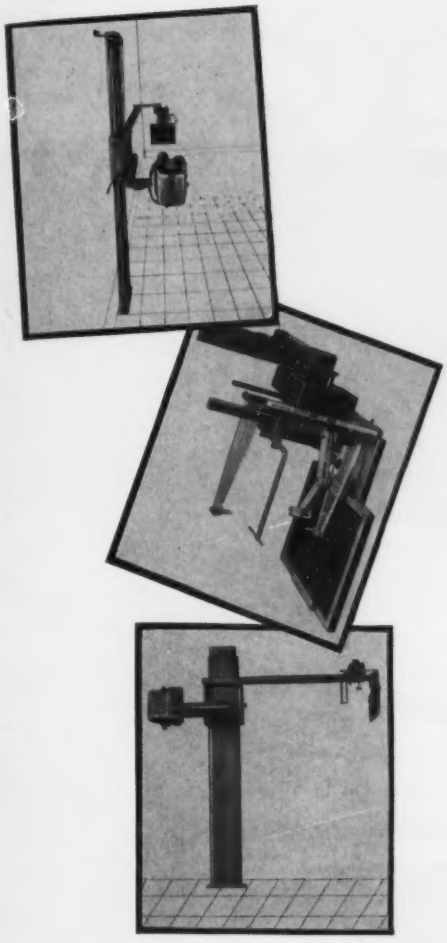

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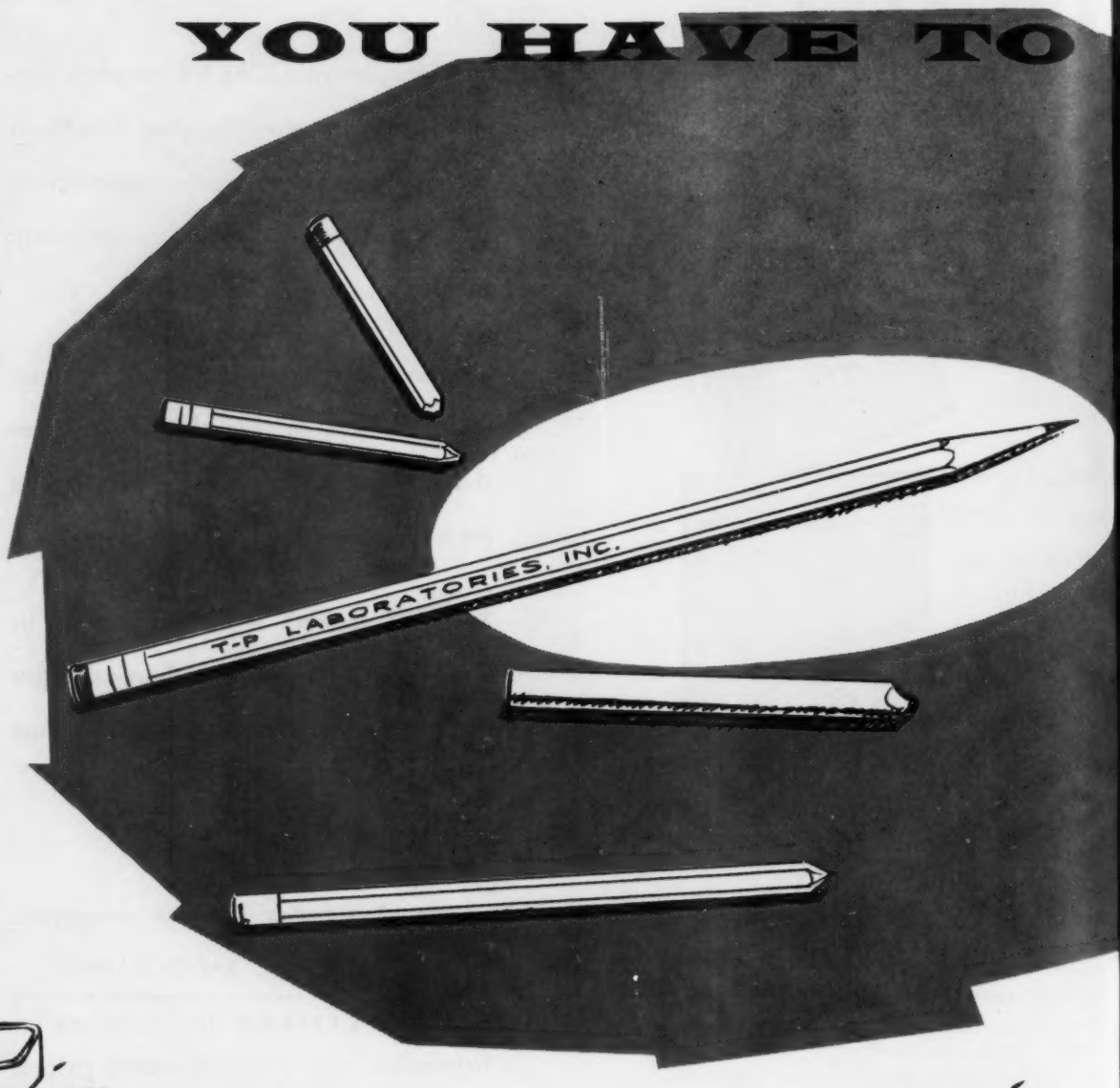

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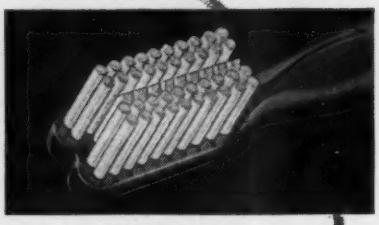

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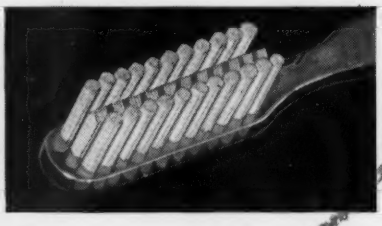

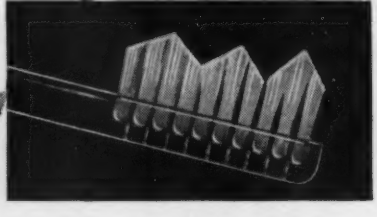

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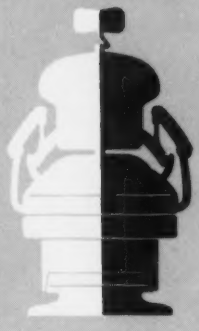

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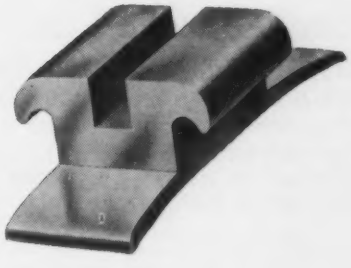

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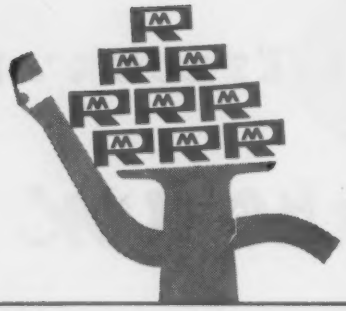

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American Journal

of

ORTHODONTICS

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VOL. 47 MARCH, 1961 No. 3

Original Articles

PRESIDENT'S ADDRESS, SOUTHWESTERN SOCIETY OF ORTHODONTISTS

JOHN W. RICHMOND, D.D.S., KANSAS CITY, KAN.

IT IS my pleasure to welcome you to Kansas City, Kansas, for this fortieth annual session. We sincerely hope that your visit will be an enjoyable one. It will be our pleasure to be of help to you in any way possible.

We are indeed fortunate to have such a splendid program arranged by Program Chairman Harold S. Born and his committee. To our invited guest essayists and clinicians, Drs. William L. Wilson of Boston, Massachusetts, Hamilton B. G. Robinson, Dean of the School of Dentistry, The University of Kansas City, and Arthur F. Lindquist, Jr., School of Dentistry, The University of Kansas City, our appreciation for your expenditure of time and talent in preparation for this meeting and in taking part in the program.

The general table clinics will be by progressive attendance at the suggestion of our beloved member, E. B. (Eddie) Arnold. You will be given a numbered ticket as you enter the clinic room. We believe this will be advantageous to both the clinicians and the members attending the clinics. Victor D. Bowles, chairman of the Clinics Committee, deserves our thanks for arranging this part of the program.

The Martin Dewey Memorial Award is given by the Southwestern Society of Orthodontists each year for outstanding contributions to orthodontics. Previously only one award has been given each year. However, upon the recommendation of the Dewey Award Committee, and with the approval of the Board of Directors at the ad interim meeting in June of this year, it was decided that more than one award could be given in any one year if such action seemed to be warranted. Consequently, two awards will be given this year to two outstanding leaders in our profession—Dr. H. Carlyle Pollock, Sr., of St. Louis,

Presented at the annual meeting of the Southwestern Society of Orthodontists, Kansas City, Kansas, Sept. 26, 1960.

Missouri, and Dr. W. B. Stevenson, Sr., of Amarillo, Texas. The Southwestern Society of Orthodontists has likewise honored itself in selecting these outstanding leaders in orthodontics to be the 1960 recipients of the Dewey Memorial Award.

I wish to express my sincere appreciation to Local Arrangements Chairman Howard H. Dukes and the officers and committees for their splendid cooperation and efficient planning in making arrangements for this meeting. To the Ladies' Entertainment Committee chairman, Mrs. John W. Richmond, and co-chairman, Mrs. Howard H. Dukes, and their committee, all credit is due for their unusual arrangements for the ladies' entertainment.

JOHN W. RICHMOND

Special attention should be directed to the work of our Qualifications Committee, headed by Robert E. Gaylord, chairman, and Leo A. Rogers, secretary. Their task is a very time-consuming one that requires sound and impartial judgment. We should all be grateful for their efforts in behalf of orthodontics and our Society.

During the course of our business meetings, you will hear a report from our delegate to the American Association of Orthodontists. In his usual efficient way, he will bring to our attention matters of interest and importance from the American Association of Orthodontists. We are fortunate to have such able representatives on the Board of Directors of the American Association of Orthodontists as Nat Gaston, director, and J. Victor Benton, alternate director. Evidence of Nat Gaston's ability is seen in the fact that he was the unanimous choice of the American Board of Orthodontics when it chose a new director at its annual meeting in Washington, D. C.

Finally, the work of the Society rests upon the shoulders of one individual—the secretary. Without any hesitation or reservation, I wish to pay tribute to Tom M. Matthews as one of the most able, careful, and efficient secretaries that this Society could have. Speaking for the Society, and particularly for myself, I wish to thank him.

In closing, I have no specific recommendations requiring official action. Instead, I want to make one general recommendation to the membership, officers, and committees: Give your careful attention and consideration to the reports and deliberations of this meeting, so that your Society will progress in the future as it has in the past forty years.

I thank you for the honor and pleasure of having been your presiding officer for 1960. To my successors, my best wishes for a most successful administration.

Brotherhood Bldg.

A DENTAL EDUCATOR VIEWS ORTHODONTIC EDUCATION

HAMILTON B. G. ROBINSON, D.D.S., M.S.,* KANSAS CITY, MO.

WHEN your president first invited me to this meeting, he asked that, as Dean of the University of Kansas City School of Dentistry, I welcome you. I accepted this fine invitation with great pleasure, and soon I began to receive reprints and notes from various members of the American Association of Orthodontists. It seemed very kind of you and your colleagues to keep me up to date with philosophy, technique, and research in your field. Soon I received a copy of your fine program and noted that a certain dean of a certain Midwestern dental school was assigned an hour to speak on "A Dental Educator Views Orthodontic Education." As a universal specialist, that dean got to work. He had been soothsaying in several areas, geographically and professionally, in the past year. He had projected the future of graduate education in dentistry for the American Association of Dental Schools at its March meeting in Chicago; he had projected the future of dental education (why not go whole hog?) for the Ohio State Alumni in Columbus in April; and he had just projected the future of dental assisting for the American Dental Association and the American Association of Dental Schools Conference in Chicago. With the crystal ball and the projector about worn out, he sought to review the past and project the future of orthodontics.

First, however, let me welcome you to the Kansas City area, where Kansas and Missouri blend to make up Mid-America. Here in Kansas City two of the earliest schools of orthodontics were established along the pattern of Angle's first school of orthodontics. Martin Dewey, a protégé of Edward Angle, began his school here. The International School of Orthodontics, apparently developed from one started in St. Louis by Benno Lischer and C. D. Lukens, was conducted here by Hugh Tanzey and William Brady. This school had a quasi relationship with the Kansas City-Western Dental College. It is from the three Missouri schools of orthodontics—Angle's, Dewey's, and Tanzey-Brady's—that all American orthodontists are descended. I have both the honor of welcoming you to this cradle of orthodontic education and the audacity to try to view orthodontic education with you.

The age in which we live may well be known as the era of science. Many in this room can remember when airplanes caused necks to stretch; now we

Presented before the Southwestern Society of Orthodontists, Kansas City, Kansas, Oct. 27, 1960.

*Dean of the University of Kansas City School of Dentistry.

watch satellites. Only eighty years ago Oklahoma was opened to homesteaders who raced, on horseback and in wagons, to stake out their claims; now jet-propelled planes streak across the skies above Oklahoma on coast-to-coast flights that take only a few hours. Almost all of you remember when we had no antibiotics and marveled at the sulfonamides. In the course of one generation we have moved from the marvels of electric power to the thrill of atomic energy and from empiric therapy to scientific treatment.

There are a few skills that have remained as individual techniques during these years of scientific upheaval. One of these areas of highly individualized technical accomplishment is in the field of dental care. We utilize newer methods, newer materials, newer equipment, and newer drugs, but by and large, we still must depend upon the individual judgment of the dentist and his application of technical skills. Even though 50 to 80 per cent of the materials, supplies, equipment, and drugs used by dentists today were research curiosities of the 1940's, most of the dentists using those gifts of science completed their dental education before these new things were discovered, invented, or developed. This speaks well for dental education, for it truly educated—preparing the dental graduate for continued professional, technical, and scientific development.

The dentist now occupies a respected position on the health services team. In "Madison Avenue-ese," his public image has improved. The health and health care of the human being are no longer the responsibility of one man. The physician, the surgeon, the dentist, the public health officer, the life scientist, and all their auxiliaries are accepted as being responsible for the patient's health. The image of the dentist on this team has been strengthened chiefly because the newer generations of dentists have accepted broader responsibilities and have not limited themselves to purely mechanical procedures. We must never lose sight of the great value and, certainly in our time, the indispensability of fine technical dentistry in general practice as well as in the specialties. However, the shiny restoration, the "natural-appearing" denture, and even the esthetically pleasing incisor alignment should not become our symbol, our goal, our sacred cow. The patient, the living human being, must be our ultimate concern, whether that patient be a small child with overlapping incisors or an old lady with an atrophic, osteoporotic mandible.

Just as dentistry is part of the health services team, there is also a team within the bigger team—the dental team. Dentists, hygienists, assistants, and technicians work side by side to improve the oral health care of the population. Within this dental team, some dentists have specialized. At present the American Dental Association recognizes seven specialties of dentistry, including orthodontics. There are still many questions concerning dental specialties and their future. During the past fifteen months two major conferences on specialties and specialism have been held at the American Dental Association headquarters. Important legislation concerning specialism will be presented at the 1960 meeting of the Association. It will be proposed that all dentists who announce themselves as specialists or as limiting their practices to one of the approved areas be required to hold a certificate from an approved national

certifying board or a state specialty license (this to be effective in 1965); that the number of specialties be limited to a minimum; that the House of Delegates continue to recognize, for a reasonable period, the present seven accepted areas of dental practice; and that the national certifying boards of the seven specialties be directed to present acceptable evidence that a majority of their diplomates restrict their practices full time to the specialties.[1] Of course, orthodontics has its national certifying board, and ten states (Illinois, Kansas, Kentucky, Michigan, Missouri, Nevada, Oklahoma, South Carolina, Tennessee, and West Virginia) license orthodontists.

In reviewing orthodontic education, it is evident that it began as an autonomous entity much the same as dental education did. Like dental education, it took this course because the older institutions (in the first place medical schools and in the second place dental schools) were reluctant to add the programs that were being demanded to fulfill the public dental need. Dr. Edward Angle became interested in orthodontics in 1880, when he was a young man of 25. In 1900 he began his school with four students. Angle had believed for many years that orthodontics would be practiced as a specialty, and he formally advocated this in 1896. He did not think of orthodontics as a part of dentistry but, rather, considered it a distinct profession. He stated that his experience in four different dental colleges over a period of thirteen years convinced him that it was impossible ever to teach orthodontics successfully to dental students. He attempted to convince the administrations at the dental schools of Northwestern University and the University of Pennsylvania that they should form special departments of orthodontics, but he was rebuffed because his plans were considered Utopian or premature. As a result, just as Horace Hayden and Chapin Harris had done in Baltimore in 1839, Edward Angle started his own school in St. Louis in 1900. How different the history of your specialty might have been had Northwestern or Pennsylvania embraced Angle's plan! In Angle's own words, "Having been entirely discouraged with my experience in dental colleges, I became filled with the belief that if orthodontia was to make any material progress, a separate school, entirely independent of dental schools, must be formed which would amply provide opportunity for those with aptitude and liking for the subject to study in a broad, thorough and comprehensive manner, and where it would be relieved from all the blighting, handicapping influences which are necessarily thrown around it in dental colleges. Hence was founded the Angle School of Orthodontia."[7]

Let us re-examine and analyze Angle's decision in view of *his* time, not of our times. The thirteen years of unpleasant, blighting experiences in dental schools must have occurred before 1900, roughly from 1885 to 1898. The dental schools of that time were often busy diploma mills. Between 1881 and 1899, thirty-seven new dental schools were started, and many dental schools of that period "freely sold the degree of doctor of dental surgery at home and abroad, to the disgrace of the profession and the dishonor of dental education."[3] Even by 1899, the requirements for entry to dental school were only equivalent to requirements for admission to a high school; the dental course took three years, with six months of instruction in each year. What a

far cry from the dental school of today, approved by the Council on Dental Education and leading the profession in technical and scientific progress! What a far cry from the days of practically no research to the present time, when over $15 million have become available for dental research, annually! Although there are those who would quote Angle as though he spoke of conditions that exist today, I feel certain that a leader, a pioneer, a thinker such as Edward Angle would be telling all of you to look about you, to peer ahead, and to stop looking back over your collective shoulders. Ancester worship can stifle professional and scientific progress, and Edward Angle, Martin Dewey, Albert H. Ketcham, and Benno Lischer, among other greats, would never have tolerated that.

In my humble opinion, the "schools" of orthodontics, which were created to meet a need of the time, led to an unfortunate approach to the science and art of orthodontics. Orthodontists tagged themselves with names of their heroes: they became Angle men, or Dewey men, or members of some other cult. Oddly, or perhaps not so oddly, like religious fanatics, they formed subcults. As each new cult was formed, the most enthusiastic disciple became the evangelist who sought freedom of thought only for those who thought as he did. One of your own members has recently directed your attention to this and has told you that each of you must be your own man and not have someone else do your thinking for you in absentia.[6] I concur strongly with his advice.

Let us move to a more recent discussion of orthodontic education. In the late spring of 1958 a representative group of orthodontists and educators met in Ann Arbor to discuss the progress of orthodontics and to plan its future. That conference expressed its collective opinion that orthodontic education for the specialist should be given by orthodontic departments of universities and recommended two-year programs at the graduate or postgraduate level, rather than a series of short courses. It expressed the desire for establishment of short courses to provide the practicing orthodontist with additional and advanced information and experience. After much discussion, it decided that preceptorship training should not be accepted as a substitute for graduate education of specialists.[4]

Thus, after almost sixty years, orthodontists agreed that education of the orthodontist as a specialist belongs in the dental school. This is good for orthodontics, for dentistry, for education, and for the patients. But what turn should this education take? Gies[3] proposed that dental schools offer programs for specialization leading to the M.S., and M.A., or Ph.D. degree. Dentists concurred in his proposal, as they were already seeking these degrees. It is paradoxical that dentists who have earned the degree of doctor of dental surgery take great pride in adding a lower degree, master's. Be that as it may, graduate courses leading to the master's degree for those wishing to be orthodontists are offered in nineteen dental schools, while seven of these schools and six others offer postgraduate education in orthodontics not leading to a degree.[2] The graduate degree has certain academic requirements which contribute more to the development of the teacher or researcher than to the development of a specialist in an area of dental practice. However, the

degree-seeking fad has developed, and it is difficult to reverse the trend. Dentists who are to become effective clinical specialists in orthodontics should be educated at the graduate level, but they need not conduct a research project and write an original thesis to be good orthodontists. One solution would be to drop the thesis as a requirement for the master's degree, but this would only result in a cheapened, tarnished, degree. Another solution is to encourage all orthodontists and other specialists-in-training to seek education and experience rather than degrees. At our school we propose to offer two programs for those who wish to gain education as specialists. One program will require a thesis, based on original research, and other academic accomplishments. It will lead to the M.S. degree. The second will be every bit as thorough in its education for specialty practice but will not prepare the student for teaching or research. It will lead to a Graduate Orthodontist diploma. We hope in this way to utilize a sematic device to lead dental graduates into excellent graduate programs designed for their needs without unnecessary expenditure of the student's and faculty's time and of the school's resources on research projects undertaken only for the purpose of status-seeking.

After completing his basic orthodontic education at the dental school, the orthodontist should be prepared to continue his education and his professional development. He may now gain much from short courses presented within or outside the ivy-covered walls of the university. He may break out of his chrysallis at this stage and undergo metamorphosis coincident with his first short course. Unfortunately, many young—and not-so-young—orthodontists do not recognize this development as being based on the fine, thorough basic orthodontic education they received at the dental school. They may sincerely believe that most of their education was acquired during that two, three, or six weeks' course after their university education; thus, they may credit their increasing ability to the short-course school and become cultists—worshiping a method, a technique or an appliance. Fortunately, their patients are not harmed, for the solid basic education these orthodontists received at dental school, at both the undergraduate and graduate levels, continues to show through. I do not mean in any way to belittle these short courses; I only hope to encourage them and to put them into their proper perspective.

Let us now look at orthodontic education for the undergraduate. Today's undergraduate is not the uneducated bumpkin of Angle's day who chose dental school rather than high school. Today's undergraduate dental students are carefully selected after they have had two or more years of college education, and at least half of them hold bachelor's degrees before they enter dental school. Here at the University of Kansas City, we selected our 116 first-year students this year from almost 500 applicants. These better students, exposed to better teachers and better teaching methods, can learn more in a shorter time.[5] Dentistry is changing, and as we learn to control tooth decay (and we will) the dentist will turn more of his attention to periodontal disease until it, too, is controlled. He will let the dental assistant and the dental hygienist perform more of the functions which he now performs, and he will have more time

for other duties. Among these will be preventive and interceptive orthodontics. Returning to the Workshop on orthodontics,[4] it was recommended that the dental graduate should be able to anticipate and detect malocclusion, to take steps to prevent or intercept malocclusion where possible, to use this knowledge as an adjunct to procedures in all other phases of dental practice, and to provide a basis for understanding the possibilities of orthodontic treatment. Hurrah! It is high time that we put more instead of less orthodontic treatment back into the undergraduate program. Dentistry must not be splintered. Suppose each of the specialties claimed that its subject matter and techniques could not be taught to the undergraduate? What would we teach? And what of the patient? It is time that schools stopped teaching orthodontics as a phase of space maintenance in pedodontics. When space maintainer begin to reposition and rotate teeth, we had better re-evaluate just what is and what is not orthodontics.

There is more need and demand for orthodontic treatment, and the demand will continue to increase with our rapidly increasing young population. The present group of orthodontists will be unable to supply the demand, and the public will turn to the family dentist. It will be a catastrophe if he cannot give preventive and interceptive care and recognize the cases that need treatment from more expert hands. Orthodontists will have all they can do and more. They will treat the more difficult patients, and this is as it should be. It is time that we stopped shadow-boxing about teaching orthodontics to undergraduates. We must present realistic, useful, courses in orthodontics at the undergraduate level. The students can and will learn. At the University of Kansas City we intend to teach preventive and interceptive orthodontics to our dental students this year.

This discussion has covered many topics in the field of orthodontics—some historical, some educational, some philosophical. My own interest in orthodontic education began not in my undergraduate years but when I taught under Benno Lischer at Washington University almost twenty-five years ago. At Ohio State my interest became more intimate, for graduate and postgraduate education was part of my administrative responsibility. Earl Jones and I spent many hours discussing orthodontic education and trying to develop it. At the University of Kansas City, Victor Bowles, Francis Calmes, and others have repeatedly discussed orthodontic education with me, and for the past twenty-five years I have taken every opportunity to learn from the practitioners in each community. I fear that orthodontists have not yet freed themselves from the romanticism of a young professional group that still carries the marks of hero worship and cultism. Some of this evangelistic approach has been good, but orthodontics will have more stature when it ceases to quibble over techniques that ride under the guise of philosophies and accepts the right of every practitioner to rely on his own independent judgment and to use the method that he believes best in each individual case. Every case is like an individualized research project, crying out for study, evaluation, judgment, design, and application of the results of cerebration.

I doubt if there is any one way to treat all cases. Surely, when light is allowed to shine freely and unfiltered into all the corners, there will be less blind following and more mature professional development. Fellow dentists, be proud of the achievements of your profession, your schools, and your specialty.

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THE TEAM APPROACH TO THE CLEFT PALATE PROBLEM

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THE Yankees won the World Series in 1956. Don Larson pitched the only perfect game in the annals of World Series history. For the Yankees to win the Series, each player was required to excel in performance for his position. Likewise, each was expected to cooperate by utilizing his ability in timing, determining the proper play for the opponent position, and knowing his teammates' ability and capacity. In short, each time a ball was pitched and hit, each player diagnosed the problems and determined his plan of attack so that he could cooperate with all of his teammates in making a successful play. This is only a small example of the many facets of life that require cooperation, understanding, and future planning. This is teamwork.

The cleft palate and cleft lip problem manifests itself in many ways. There may be just a simple cleft of the lip, or the alveolar ridges and the hard and soft palate may be involved. The infant is brought into this world with a problem, but it is his parents, grandparents, aunts, and uncles who really have the problem; they are the ones who have to live with the problem before treatment takes place. It is my aim in this article to show the necessity for cooperative diagnosis and future treatment to relieve the family of a possible lifelong burden.

In the past, treatment of the cleft palate and cleft lip patient was considered surgical in nature. After many years of this thinking, often with very undesirable results, the concept has been changed. We know that the surgical lip repair is a necessity, for persons with lip deformities are not acceptable to our society.

Other problems begin to arise, however, as the infant grows and develops. We must consider these problems in the development of the individual patient. Was there a complete lack of development of the necessary tissue, or just an incomplete joining of the parts? Knowing that the hard and soft palate is missing or incomplete injects the possibility of middle ear and hearing problems. If, in his development, the infant cannot hear correctly, his ability to learn will be jeopardized. The child's hearing is evaluated by the audiologist, and great importance is attached to this evaluation.

Presented at the annual meeting of the Southwestern Society of Orthodontists, Kansas City, Kansas, Sept. 27, 1960.

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During the examination of each patient the different medical and dental specialists determine their treatment programs and plans so that during the staff discussion of the problem each facet of the treatment plan may be examined, rearranged, changed, or eliminated to coordinate with other more important parts of treatment.

Aside from the original deformity, the patient's age, the distance that he travels for treatment, his occupation, and his general physical condition and health must be considered before the treatment program is begun.

Modern surgeons no longer accept the idea that early surgery is necessary for the patient's survival or that this is the preferred method and always assures functional restoration when completed. The patient's age, physical development, and health are always taken into consideration before a surgical procedure is undertaken. Lip surgery is done when the infant weighs enough to withstand the surgical trauma.

Surgery of the palate is not performed early. A large deformity of the palate does not constitute an emergency in the infant. There are many treatment devices which can be employed to remedy this problem, such as (1) extra large nursing-bottle nipples to help close off the cleft, (2) large nipples with enlarged holes, (3) the Breck feeder (a syringe with a rubber tube), (4) a lamb's nipple (an extra long nipple), and (5) a plastic feeding appliance which closes off the cleft and permits the use of a normal nipple. With these aids available, the parents can work out a normal feeding program and the patient can grow and develop.

As the infant grows, speech sounds develop. The speech therapist feels that a proper speech mechanism should be designed as early as possible. If the cleft is wide with insufficient tissue, then surgery will be postponed and a prosthesis will be planned. A prosthesis may be constructed and placed at any age. In our cleft palate community we have placed prosthetic appliances for patients of all ages, ranging from a 1-week-old 3 pound premature baby to a 75-year-old man. Difficulties arise in any case. Therefore, treatment must be planned intelligently if it is to be successful.

In determining the proper treatment plan, the end speech result is uppermost in the minds of all diagnosticians. It is well to remember that even with fair to good facial or lip surgery, and with better-than-average intelligence, unintelligible nasal speech is a detriment and will cause treatment to be unsuccessful. Therefore, treatment planning in the light of available speech therapy and the patient's ability to assimilate this therapy is important. Planning of the surgical or prosthetic treatment will hinge on the speech therapist's experience in determining the patient's ability to bring about good speech.

Good speech is not something that one is born with. It is a complex thing which is learned over a period of time. If the mechanism is improperly designed or developed in the beginning, many bad habits can develop. Unlearning bad speech habits can be more difficult than learning good speech with a properly prepared mechanism to begin with. If it is determined that

the available tissue is insufficient for successful surgery, then the prosthesis or speech appliance will be constructed. It might be well to state that surgery at an early age can almost always be considered successful, but subsequent growth and development may cause the involved tissue to be inadequate in length, movement, and thickness. This, then, would make the earlier successful surgery a failure. To prevent these failures, we reduce the number of early surgical attempts.

With improvements in materials and techniques, speech appliances can be made extremely successful. The exacting reproduction of the oral defect can be obtained very accurately with the new materials. With the newer plastics and lighter metals, the appliance can be made esthetic as well as functional, and it is easy to clean. As stated earlier, prosthetic appliances can be made for the very young infant, as well as for the elderly patient, with reasonable ease. Prosthetic replacements are truly a vital part of the cleft palate program.

In conclusion, the team approach to cleft palate and cleft lip problems involves all medical and dental specialists. The combined efforts of these persons are vital in determining the preventive, corrective, and recuperative procedures necessary in treating all of these patients. Only with such cooperative efforts can the most esthetic and complete rehabilitation be achieved.

ORTHODONTIC POSITIONER TREATMENT DURING ORTHOPEDIC TREATMENT OF SCOLIOSIS

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INTRODUCTION

WHEN orthopedic casts and braces are used in the treatment of scoliosis, distressing dental protrusion and decreased vertical dimension in the lower face often become rapidly evident. This study was undertaken in an effort to stabilize the maxillofacial complex against the pressures of such appliances during orthopedic treatment of scoliosis. The orthodontic potentials interrelated in combining the use of a dental positioner with orthopedic brace and cast application during such treatment were recognized immediately. As a result, this study was quickly expanded into an endeavor to accomplish corrective orthodontic movements while simultaneously supporting the maxillae, the mandible, their alveolar processes, and all dental components against the pressures of orthopedic appliances.

Ideally, holding the maxillae and the mandible relatively fixed in their craniofacial relationships and anchoring teeth within their alveolar bases better stabilizes cervical orthopedic cast molding or brace placement and simultaneously increases the patient's comfort while orthopedic appliances are being worn during treatment of scoliosis.[6] With the intention of stabilizing the teeth into such a unit, dental positioners (Fig. 1) were used to prevent undesired dental and osseous movement in the craniofacial complex during orthopedic treatment of scoliosis. Later, already existing malocclusions were corrected. This was based on the premise that those teeth which were not moved would act as anchorage (or as a stabilizing unit) through which, by means of the positioner's resilience, necessary repositioning of teeth could be accomplished.

Gray,[5] Oppenheim,[16] and other research workers have recognized that bone resorptions occur during periods of pressure, with bone repair appearing only when that pressure is relieved. Gray,[5] Daniel,[4] and Mead[14] studied the influence of pressure in osseous growth and function as related to scoliosis, and each of them observed that such changes were more evident in the younger patients. Offer-Spitz[15] recognized the damaging effect of relatively small forces acting against osseous tissue for long periods of time.

Sicher[19] has observed that growth of the mandibular condyle (which normally occurs when the patient is at the age for orthopedic treatment of

This thesis, which was given as a partial fulfillment of the requirements for certification by the American Board of Orthodontics, is being published with the consent and the recommendation of the Board, but it should be understood that it does not necessarily represent or express the opinion of the Board.

scoliosis) removes the mandibular body from the base of the skull and thus creates a space between the maxillae and the mandible during the normal transitional growth. Consequently, we must recognize the possibility that a lengthy application of cast and brace force against the mandibular inferior surface during orthopedic treatment of scoliosis might interfere with the normal pattern of condylar growth. (Such treatment often continues over periods of one to three years.)

Kjellgren[12] and Stallard[21, 22] have shown the influence of external pressure upon dental occlusion. The former showed lateral deformation of the maxillae with continuous application of pressures by a 7 cm. rubber ball. He applied pressures of 50 grams per centimeter, which is less than the force of a fist held against the face during sleep, for two to three and one-half hours daily over periods of several days. A high recovery value was noted subsequent to the application of these forces. From 1925 to 1930, Stallard,[21, 22] after careful observation, demonstrated interrelationships between pressure habits and dental malocclusions and showed that various extraoral pressure habits could result in deformation of bone structure.

Knowledge of the plastic and adaptable structure of bone leads us logically to recognize that continuous pressures from orthopedic casts could most certainly change the shape of the structures against which they are applied. This was recognized as early as 1926 by Howard,[7] who observed rapid vertical changes after wedge-type plaster body casts had been worn for forty days during orthopedic treatment of scoliosis. He noted an infraclusion of the posterior teeth within three weeks. Howard[7] used a removable splint to maintain maxillomandibular dental relationships during this type of treatment and observed that this appliance did not prevent depression of teeth or reduction in vertical dimension of the lower third of the face. His theory was that stabilization of all teeth in each arch to create a unit of resistance against the force exerted by orthopedic cast application should reduce labioversion of the teeth and decrease loss in vertical dimension occurring during orthopedic treatment of scoliosis.

Thompson[24, 26] has shown that retardation of the condylar growth center, either unilaterally or bilaterally, can result in progressive deformation of the entire dental and craniofacial growth pattern, with secondary alterations being shown in various parts of the oral mechanism. Here may be seen relationships in the unilateral application of force during the placing of Risser jackets and Milwaukee braces (Figs. 3, 4, 5, 10, 12, and 13). Thompson also noted that this growth-center alteration from pressure occurs in children more easily than in adults.

Since we are dealing with growing children, many of whom have idiopathic scoliosis, muscular imbalance resulting from growth deficiency may be an etiological factor. We must recognize that both growth deficiency and the application of abnormal pressures over long periods of time may be responsible for malocclusions related to applications of force against the craniofacial complex during the orthopedic treatment of scoliosis.

Stilwell's[20] studies demonstrate that muscle tensions upon the mandible are effective unilaterally in the twisted and torqued positions into which the cranium and mandible are placed when the patient wears a cast during treatment for scoliosis. Therefore, it must be recognized that (1) growth interference, (2) abnormal muscular tensions or pressures, and (3) continuous external pressures may be acting upon the mandible to alter its relationship to the cranium and to change the position of the teeth in relation to their alveolar bases during the time the patient wears orthopedic casts or braces while scoliosis is being treated orthopedically.

In this study the clinical end results were evaluated. It was not practical, with the methods used, to determine the responsibility of either pressure or growth inhibition as a separate entity.

PROBLEM

Risser jackets,[17] body casts, and Milwaukee braces[1] are placed by orthopedic surgeons to offset or oppose spinal positions that have resulted from scoliosis.[18] When these orthopedic appliances are placed, unilateral pressures are often applied against the inferior mandibular body and ramus surfaces. Frequently, the chin is elevated and the head is tipped backward from 10 to 45 degrees prior to casting.[3] After casting, the angle of chincap contour at times causes the mandible to be directed posteriorly and superiorly with respect to the cranium. Mandibular and maxillary lateral constriction is possible following close bilateral adaptation of plaster casts to the mandibular rami.

If initially there is mesial or protrusive inclination of anterior teeth, and/or if the posterior teeth are initially missing (with attendant loss in height of the lower third of the face and in posterior vertical dimension having already occurred), this anterior dental protrusion may quickly become exaggerated after the cast has been placed (Fig. 17). The age and health of the patient, the plasticity of bone, the closeness of cast adaptation, and the degree of tension incorporated during casting are related to the extent of dental deformity that then occurs and to the degree of resultant malocclusion.

Because of the position of reverse spinal curve in which the scoliosis patient is placed (Figs. 3, 4, 5, 10, 12, and 13) prior to fabrication of the initial cast or brace, pressure is exerted laterally as well as inferiorly against the body and ramus of the mandible on the side of the original scoliosis (Fig. 13). After casting, marked deviation of the chin away from the side of the original scoliosis usually becomes evident, since the opposite side of the mandible is contacted first by the collar of the orthopedic cast or brace (Figs. 4 and 12).

Collar pressures of occipital and mandibular casts or braces are intrinsically interrelated. When the patient's musculature is relaxed these collar pressures are in direct proportion to the degree of spinal curvature correction effected during casting or bracing.[3] The potential for maxillary, mandibular, and craniofacial change in orthopedic appliance applications during treatment of scoliosis is great.

During placement, orthopedic appliances are molded anteriorly close to the inferior surfaces of the mandibular body and the lateral surfaces of the mandibular rami. They also are adapted posteriorly in close proximity to the occipital

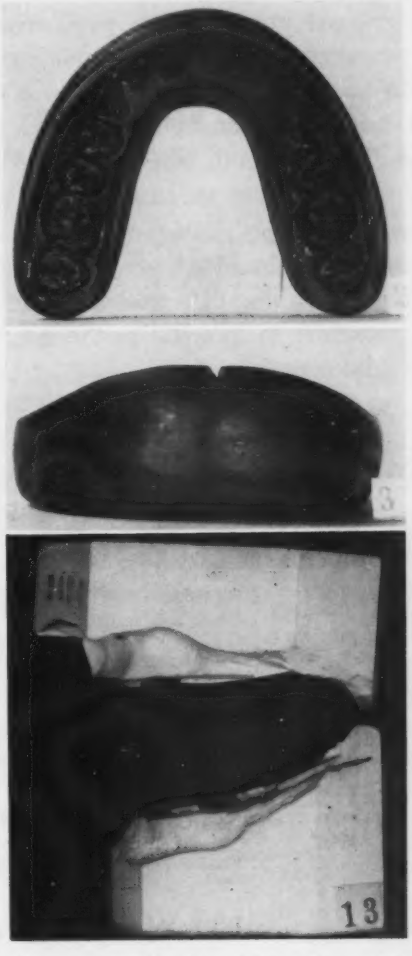


Fig. 1.—Orthodontic positioner used in this study along with orthopedic appliances during the treatment of scoliosis. *A*, Positioner from occlusal view. *B*, Anterior view of positioner. *C*, Lateral view of positioner.

base of the cranium (Figs. 4, 5, 8, 12, and 13). By extending the head from the cast or brace and straightening the spine, the patient can temporarily relieve this upward pressure on the inferior mandibular surfaces. However, positional fatigue quickly becomes evident following casting. When the patient then assumes a relaxed position, there is a continuous superior and anterior thrust through the inferior surfaces of the body of the mandible, which is translated through the osseous process and periodontium to the teeth of both the maxillae and the mandible. This results in delivery of an increased anterior force component upon all teeth and may ultimately move (Fig. 17) the maxillary (and at times the mandibular) anterior teeth and alveolar processes into more procumbent positions in relation to their bony bases and to the cranium. The

dental protrusion (Figs. 16 and 17), with or without spacing, that often results is of immediate concern to the orthopedic surgeon,[6, 13, 14] the patient, and the patient's family.

It would seem logical to include prevention or correction of protrusions and mid-line deviations created by appliance pressures in the treatment plan and to distribute these pressures more evenly during the application of orthopedic casts and braces in scoliosis treatment. It would appear practical and logical to maintain maxillary and mandibular cranial relationships as well as a fully functional position[13] of the teeth when orthopedic appliances are placed. Certainly, this should help to prevent serious malocclusions.

With variable results, dental appliances constructed of dental compounds,[7, 2] metal splints,[7] wax,[7] rubber,[13] vulcanite,[2] acrylic,[2] and soft plastic materials have been interposed between the maxillae and the mandible during orthopedic treatment of scoliosis in an effort to immobilize the maxillae, the mandible, and the teeth with the craniofacial complex.

METHOD

In the present study, which covered a period of three and one-half years, one-piece rubber dental positioners (Fig. 1) were employed in forty scoliosis

Table I. Summary of Data

PATIENT	SEX	CASE NO.	COOPERATION OF PATIENT DURING TREATMENT	ORTHOPEDIC FACTORS		
				DIAGNOSIS	CORRECTION OBTAINED	APPLIANCE WORN
L. L.	F	2841	Excellent	Scoliosis	Excellent	Milwaukee brace
G. G.	F	2450	Irregular but good	Scoliosis	30 degrees	Body casts
F. M.	F	2903	Good	Scoliosis	Recurrent	Risser jacket
J. C.	F	2926	Good	Scoliosis	20 degrees	Milwaukee brace
E. M.	F	2769	Intermittent, then fine	Idiopathic scoliosis	30 degrees	Risser jacket
R. M.	M	2442	Irregular, fine Later	Scoliosis	Excellent	Milwaukee brace
B. L.	F	2449	Good	Scoliosis	35 degrees	Body casts
S. H.	F	2451	Good to Excellent	Scoliosis	Satisfactory	Milwaukee brace, body cast
M. B.	F	2888	Excellent	Scoliosis	Satisfactory	Milwaukee brace
D. S.	M	2624	Good	Idiopathic scoliosis	20 degrees	Risser jacket, Milwaukee brace
P. H.	F	2614	Poor	Idiopathic scoliosis	30 degrees	Body casts
S. S.	F	2632	Irregular; poor early, improved later	Scoliosis	30 degrees	Body casts

TABLE II. SUMMARY OF DATA

PATIENT	AGE DURING TREATMENT (YEAR AND MONTH) START	AGE DURING TREATMENT (YEAR AND MONTH) END	TOTAL TREATMENT TIME (MONTHS)
L. W. (Figs. 2-4)	11-3	12-5	13
G. G. (Figs. 5-7)	12-9	14-10	25
F. M. (Fig. 8)	17-2	18-6	14
J. C. (Fig. 8)	13-7	14-2	7
E. M. (Fig. 9)	12-11	14-6	19
R. M. (Figs. 10, 11)	14-8	17-0	32
B. L. (Fig. 12)	15-8	17-9	25
S. H. (Figs. 13, 14)	8-10	11-8	34
M. B. (Fig. 15)	14-4	14-11	7
D. S. (Fig. 16)	5-11	6-11	12
P. H. (Fig. 17)	13-2	14-1	11
S. S. (Fig. 17)	14-7	15-7	12

patients, aged 6 to 19 years, who were treated over periods of seven to thirty-four months. These positioners were used in an attempt to maintain or improve orthopedic cast or brace cranial stabilization while simultaneously maintaining or improving dental occlusal and dentofacial relationships. The results of combining correction of minor dental malocclusions with support of the mandible against an inferior mandibular thrust from orthopedic appliances which used the mandible for terminal support have been clinically evaluated (Tables I, II, and III) in forty patients undergoing orthopedic treatment for scoliosis

TABLE III. SUMMARY OF ORTHODONTIC DATA

PATIENT	CLASSIFICATION FOR DIAGNOSIS (ANGLE)	INTERVAL OF TREATMENT START	INTERVAL OF TREATMENT END	CORRECTION OBTAINED IN DENTAL OCCLUSION	NUMBER OF POSITIONERS WORN
L. W.	Class I with cross-bite	Jan. 6, 1958	Feb. 4, 1959	Improved	4
G. G.	Class II with cross-bite	May 31, 1958	June 11, 1958	Improved	3
F. M.	Class II (mutilated)	April 8, 1958	Jan. 30, 1959	Improved	2
J. C.	Class I	May 6, 1958	Dec. 10, 1958	Improved	2
E. M.	Class II, Division 1, subdivision R	Aug. 25, 1957	March 19, 1959	Improved	5
R. M.	Class I (mutilated)	May 26, 1956	Jan. 23, 1959	Improved	5
B. L.	Class II (?)	May 31, 1956	June 10, 1958	Improved	2
S. H.	Class I	May 31, 1956	Feb. 4, 1959	Improved	4
M. B.	Class I extraction	May 5, 1958	Dec. 10, 1958	Improved	2
D. S.	Class I with Class II tendency	April 17, 1957	April 25, 1958	Improved, then later relapsed	2
P. H.	Class II	April 17, 1957	Feb. 11, 1958	None—occlusion became worse	3
S. S.	Class II	April 30, 1957	April 4, 1958	None—occlusion became worse	4

under both hospital and home management. One or more one-piece elastic positioners were placed for each patient before or after fabrication of orthopedic casts or braces. These elastic positioners were made on duplicate plaster models of the patient's teeth (Fig. 2). Treatment objectives were to maintain existing dental and maxillomandibular relationships. In most cases an attempt was made at simultaneous correction of dental irregularities that were present by improving positions of individually malposed teeth.

These dental positioners which were fabricated of vulcanized rubber were made in the rest position with a 2 to 3 mm. opening of the jaws.[20, 23, 25, 27] With the positioner inserted (Fig. 10), the maxillary-mandibular cranial complex (with integrated dental components) is stabilized cranially against placement of the orthopedic cast or brace. At the same time, elastic force within this rubber appliance guides teeth toward their predetermined setup position as the patient voluntarily or involuntarily exerts muscular force into the positioner (Figs. 6 and 11). Guidance for this movement originates from force exerted by the superior end of the jacket or brace molded against the mandible and by active contraction of the muscles of mastication during four hours or more of regular daily exercises with the positioner in place. This muscular contraction lasts for fifteen seconds and is followed by a one-minute period of muscle relaxation (with the teeth remaining in the positioner) during exercise periods of thirty minutes or longer. The optimum time for such active daytime wearing of the positioner was found to be four hours daily.[8, 11] Force exerted through the cervical end of the orthopedic cast or brace against the inferior mandibular surface continues constantly during relaxation (that is, for the entire time that this dental positioner is properly worn along with the orthopedic cast or brace) and is transmitted through the resilience of rubber to the dental units being moved. In addition to active daytime wearing for at least four hours daily, the patient wears the positioner between his teeth passively during sleep and during all wakeful hours (except while eating, cleaning the teeth, and talking).

MANAGEMENT OF POSITIONER TREATMENT

Cooperation of the patient is the key to success in positioner treatment. Showing the patient the intended change in occlusion as compared with the present occlusion stimulates interest and cooperation. Obviously the intended change in occlusion should be carefully worked out within the physical limits of the positioner (or positioners) so that the objectives shown may actually be obtainable. Frequent appointments, with constant encouragement, are a must in the treatment of these cases. The intended tooth movement will take place at a more consistent rate with constant wearing of the positioner. It is constructive to tell patients that progress lost because of their failure to wear a positioner is harder to regain a second time. All of these patients must be given encouragement. It would seem unwise to compliment a patient upon doing a good job of wearing his positioner, because he may subsequently quit wearing it regularly.

It was found that bringing together two or more patients who were wearing positioners created a situation favorable for more satisfactory treatment. When younger patients could be made to regard positioner wearing as a game and when older patients were challenged to compete with one another in wearing positioners, these patients were stimulated to better cooperation. A full explanation to the nursing staff leads to improved nursing cooperation and to the fitting of positioner wearing into the regular hospital routine.[6] Sometimes immediately, but invariably within six to ten days after the positioner has been placed, the patient feels that the rubber positioner acts as a "cushion" between the teeth (if orthodontic tooth resetting prior to fabrication of the positioner has been done within tolerable limits clinically and within the positioner's potential corrective range).

After the patient's initial adjustment to the position is made, graduated orbicularis oris exercises, thirty times three times a day (Fig. 11), to develop maxillary lip tone and length and the temporomasseter exercise (Fig. 6), thirty times three times a day, to enhance tooth movement can be constructively added as a myofunctional supportive program. The facial component of muscles and the suprahyoid group of muscles interplay in the contraction of the muscles of mastication. Circulatory stimulation attendant to this muscular activity appears to be constructive in maintaining skin tone under the cervical portion of the cast.[6] Improved periodontal tone becomes quickly evident as positioners are worn in this manner. Although daily oral hygiene was carefully kept at a high level, this improvement in oral tissue tone appeared to be the result of increased gingival massage of the rubber positioner.

MANAGEMENT OF PATIENT DURING POSITIONER TREATMENT

The placing of a positioner into the mouth is important, particularly if labioversion has been corrected in the positioner setup. After it has been placed in the mouth, the positioner is hooked anteriorly over the incisal edges of the maxillary anterior teeth. (A frenum-relieving notch should be made in the superior anterior midline border of the positioner to make it easy for the patient to locate the maxillary midline area.)

This anterior labial flange, after being hooked over the incisal edges of the maxillary anterior teeth, serves as a holding place for stretching the positioner posteriorly over the maxillary posterior teeth. Finally, the positioner is moved superiorly into position fully over the maxillary teeth. Seating of the positioner is completed as the mandibular teeth are closed into the inferior tooth imprints and the teeth are clenched into the positioner (Fig. 11). If the patient simply pushes the positioner into his mouth and bites it into position, the maxillary teeth may not be fully engaged into it. Thus stabilizing for the cervical end of the orthopedic cast as well as positional corrections established in the positioner setup will be lost.

Encouragement to the patient is a good morale builder, and it is a necessity if continued cooperation is to be maintained. The patient can be constructively motivated on the basis of esthetic and cosmetic considerations.

Positioner exercising may work in conjunction with hospital occupational therapy. Regularity in the patient's exercise schedule can be achieved most satisfactorily with conscientious and dedicated nursing care and by grouping together in the hospital ward two or more patients who are wearing positioners.

The patient should be encouraged to stretch his lips over the positioner (Figs. 5 and 6), closing them so that lip action will become stronger. Thus, a more relaxed lip line will develop. Actual improvement in facial outline subsequent to such positioner wearing may be noted.

Difficulties were encountered when mouth breathing caused by nasal congestion or allergic reactions prevented the patient from wearing a positioner (Case 5). This need be true only during sleep, however, since the patient can place the positioner in or out of the mouth in the daytime if sufficiently motivated.

EXAMINATION OF PATIENTS UNDERGOING POSITIONER TREATMENT

Items to be observed during examination include the following:

1. Proper insertion and complete seating of positioner in mouth.
2. Force of biting into positioner.
3. Tooth root movement.
4. Sustaining of force of closing into positioner during exercise interval.
5. Keeping teeth engaged in positioner during relaxation period after exercise.
6. Keeping positioner in place and teeth in positioner constantly except when eating or talking.
7. Evidence of local soreness.
8. Evidence of tooth soreness.
9. Tooth mobility.
10. Tooth movement.
11. Occlusion of teeth.
12. Vertical dimension.
13. Changes in craniofacial tooth relationship and jaw relationship.
14. Evidence of not removing positioner when talking.
15. Cleanliness of positioner.
16. Oral hygiene of patient.
17. Temporomandibular joint function.
18. Lip position and development.
19. Presence of skin irritation from cast on mandible.
20. Time that positioner is being worn.
21. Attitude and cooperation of patient.
22. Encouragement of patient.

Clinical Examination.—When a patient with a positioner in his mouth is examined during treatment, with the teeth occluding fully into the positioner,

finger pressure over tooth root apices will indicate whether the positioner is fully engaged and show the degree of underlying tooth root movement being obtained within the alveolar process.

During the time that the positioner is being worn, a marked improvement in oral hygiene is usually observed. Patients wearing positioners evidence much

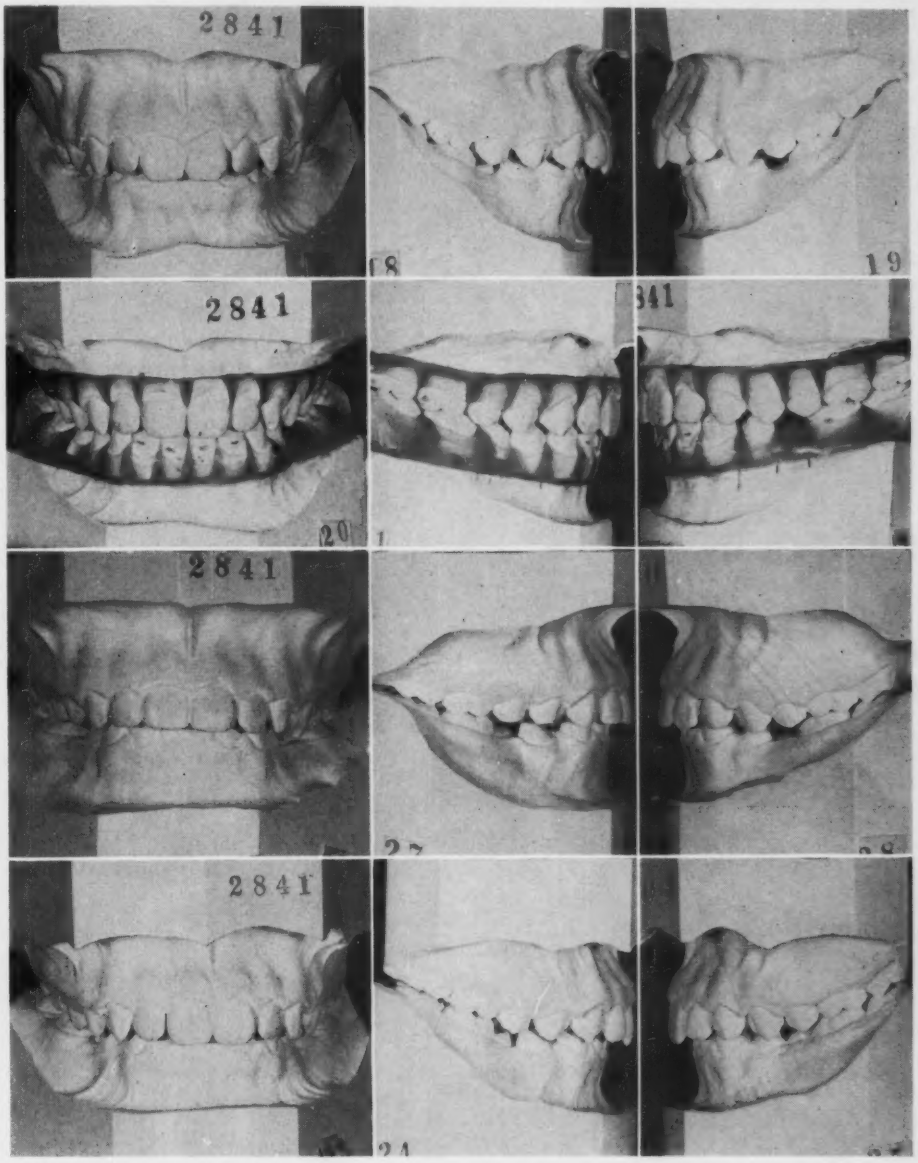


Fig. 2.—Patient L. W. *A*, Original malocclusion on Jan. 6, 1958. *B*, Original positioner setup. *C*, Positional change by March 26, 1958. *D*, Positional change by May 21, 1958.

better gingival tone and health than other patients who are not wearing positioners. It is vital that the teeth be cleaned after each meal or snack and that the positioner be cleaned after removal and prior to replacement in the mouth. If food material or debris becomes interposed between the positioner and the

tissue, irritation may result. If the patient acquires the habit of putting the positioner into the mouth and closing hard upon it to seat it, particularly if correction of labioversion has been introduced into the positioner setup, the underlying gingivae under the force of occlusion may be injured. Furthermore, the peripheral flange of the positioner may soon break down when a patient places the positioner in his mouth by this careless method.

CASE REPORTS

CASE 1.—Patient L. W., a girl aged 11 years, 3 months, gave excellent cooperation throughout treatment while wearing Milwaukee braces and undergoing a spinal fusion in obtaining excellent spinal correction of scoliosis. By means of four positioners worn during thirteen months of combined orthopedic-orthodontic treatment as previously described, the patient's Class I (Angle) malocclusion with cross-bite was improved (Figs. 2, 3, and 4).

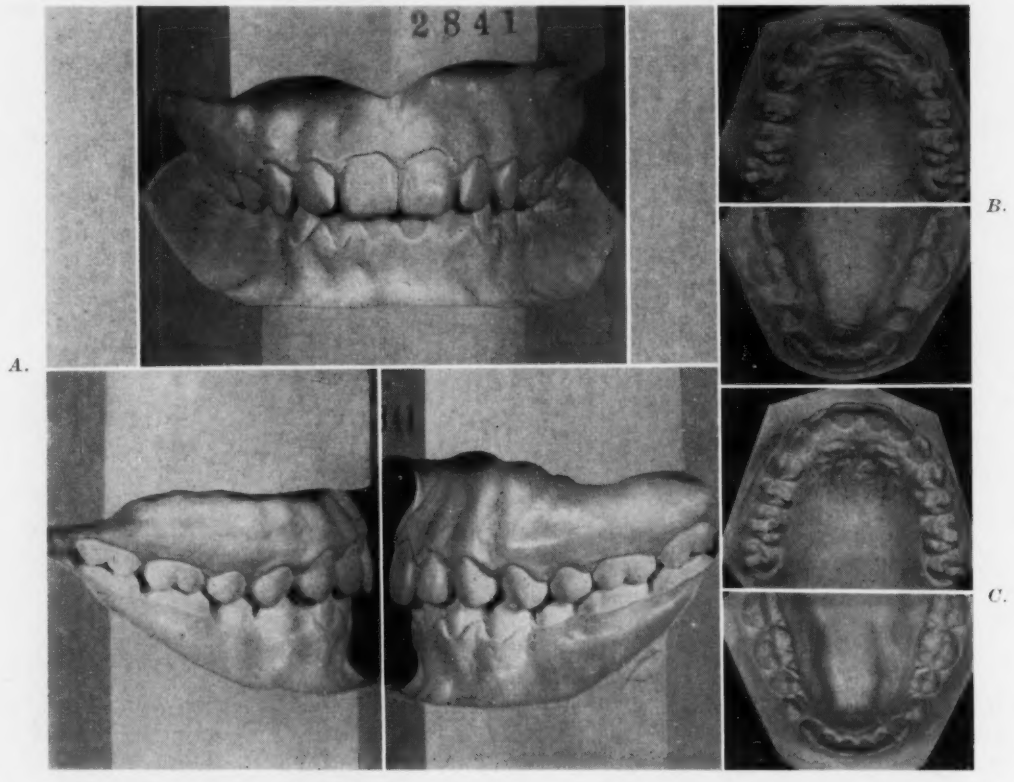
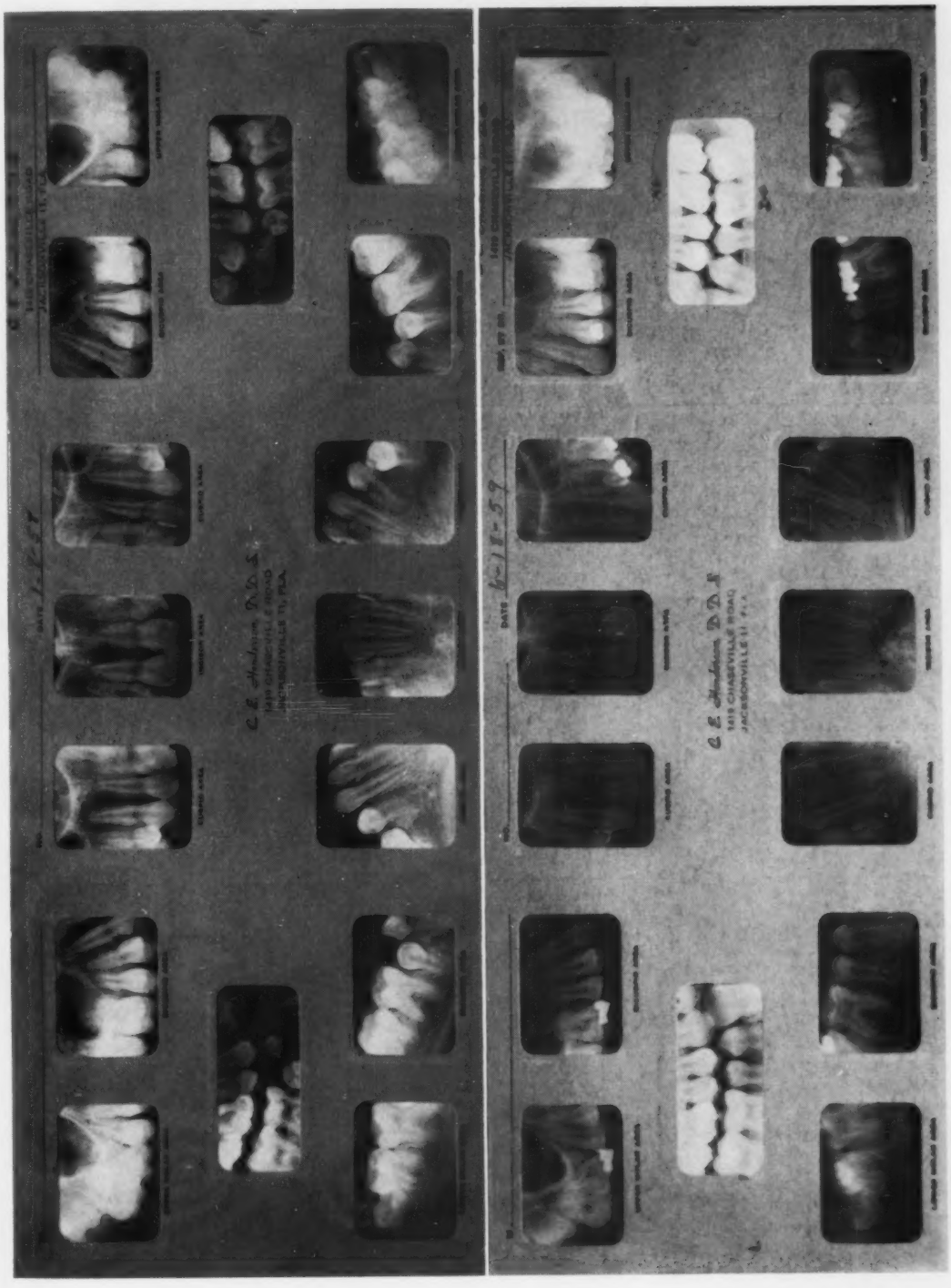


Fig. 3.—Patient L. W. *A*, Final occlusion on Feb. 4, 1959. *B*, Original occlusal view, Jan. 9, 1958. *C*, Occlusal view at end of treatment, Feb. 4, 1959.

(Continued on following page.)

CASE 2.—Patient G. G., a girl aged 12 years 9 months, gave irregular but good cooperation during treatment which involved several body casts and spinal fusions to gain a 30 degree spinal correction of scoliosis. The wearing of three positioners during twenty-five months of combined orthopedic-orthodontic treatment brought about an improvement in this patient's Class II (Angle) malocclusion with cross-bite (Figs. 5, 6, and 7).

CASE 3.—Patient F. M., a girl aged 17 years 2 months, demonstrated good cooperation while wearing a Risser jacket and undergoing spinal fusions during treatment of recurrent



D. *E.*

Fig. 3 (Cont'd).—*D*, Original full-mouth roentgenograms, Jan. 8, 1958. *E*, Final full-mouth roentgenograms, June 16, 1958.

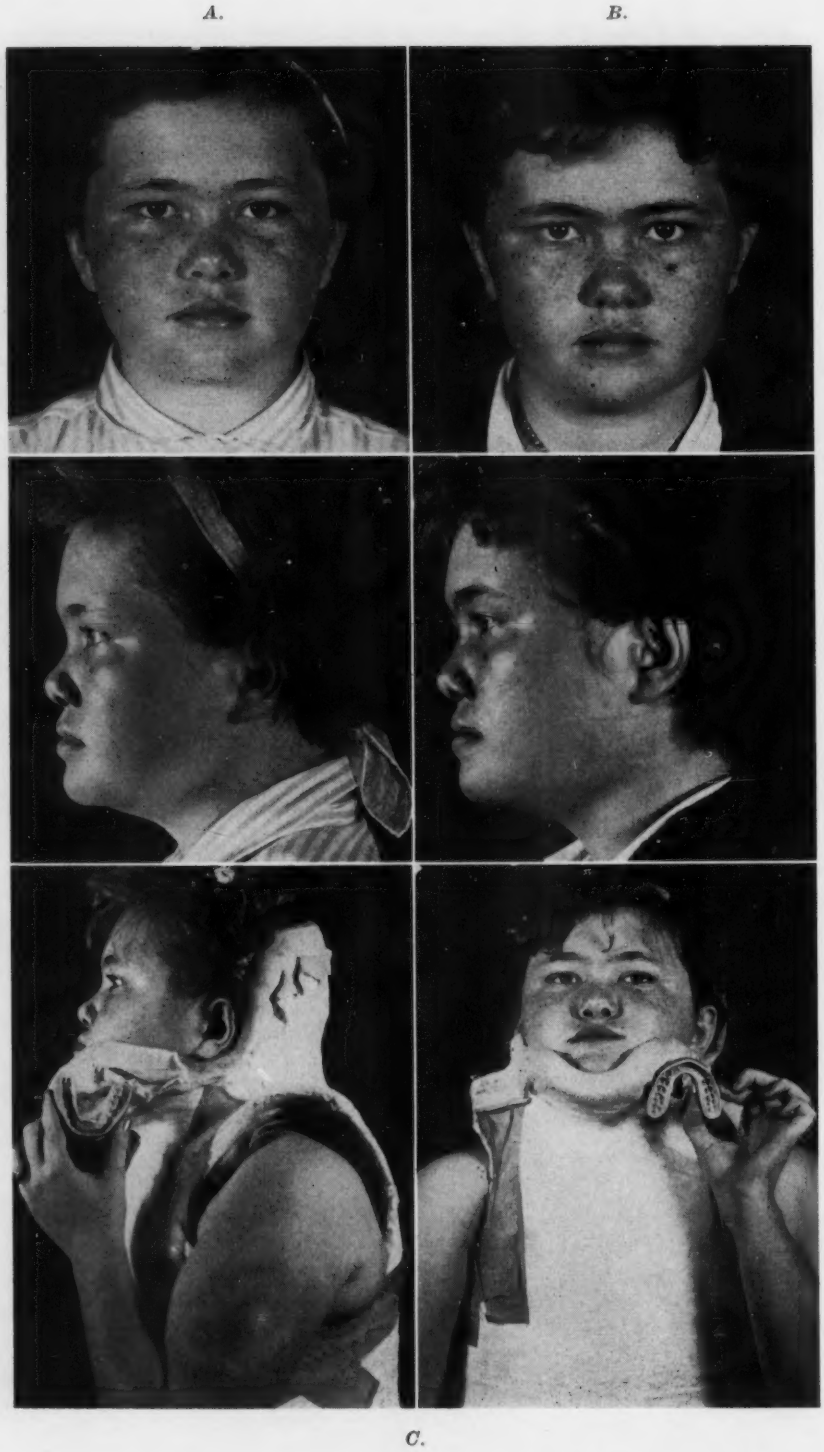


Fig. 4.—Patient L. W. *A*, Photographs taken on Jan. 9, 1958, before treatment. *B*, Photographs taken on Jan. 29, 1959, during treatment. *C*, Photographs taken on Oct. 30, 1959, without positioner. Risser jacket showing extreme of head placement during casting.

scoliosis. Two positioners were worn during fourteen months of combined orthopedic-orthodontic treatment to change her Class II mutilated (Angle) malocclusion as illustrated in Fig. 8.

CASE 4.—Patient J. C., a girl aged 13 years 7 months, showed good cooperation during treatment while wearing Milwaukee braces and undergoing a spinal fusion to obtain a 20 degree correction of scoliosis. With the wearing of two positioners over seven months of combined orthopedic-orthodontic treatment, her Class I (Angle) malocclusion showed the improvement pictured in Fig. 8.

Fig. 5.—Patient G. G., July 2, 1956. *A*, Body cast illustrating forces applied cranially. *B*, Casted position, positioner not in place. *C*, Casted position, positioner in place.

CASE 5.—Patient E. M., a girl 12 years 11 months of age, gave intermittent and then good cooperation while wearing Risser jackets and undergoing spinal fusions to obtain a 30 degree correction of idiopathic scoliosis. The wearing of five positioners over a nineteen-month period of combined orthopedic-orthodontic guidance improved the patient's Class II, Division 1, subdivision (Angle) malocclusion as shown in Fig. 9. During treatment, a four-week discontinuance of positioner wearing resulted in the loss of previously gained dental improvement and the appearance of a more severe malposition of maxillary and mandibular teeth with an increased maxillary anterior diastema. Subsequent excellent cooperation, combined with a series of positioners graded to effect dental changes in stages, resulted in the final occlusion shown in Fig. 9.

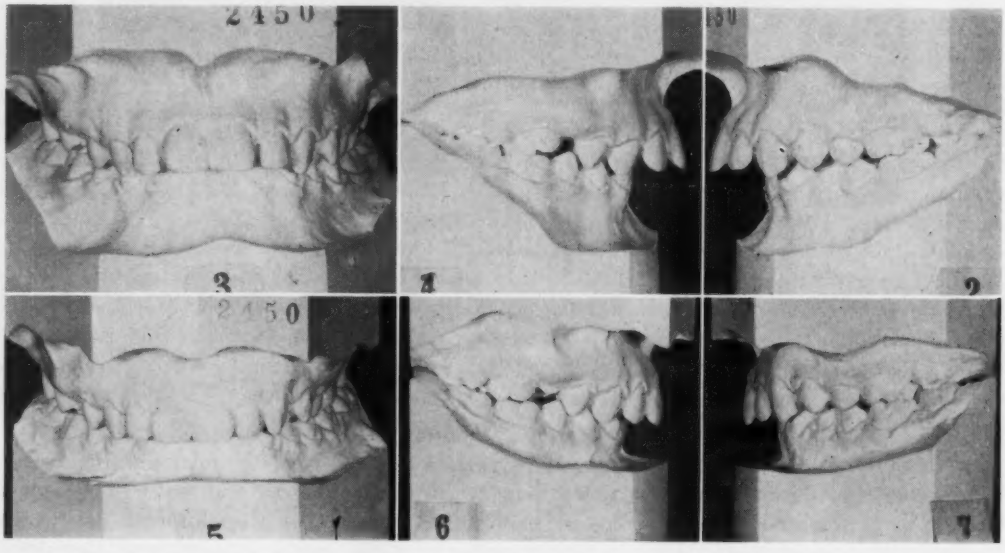
CASE 6.—Patient R. M., a boy aged 14 years 8 months, gave irregular and then excellent cooperation during treatment while wearing Milwaukee braces and undergoing spinal fusions to obtain excellent correction of scoliosis. By means of five different positioners (some of them worn twice during different stages of dental space closure) over thirty-two months of combined orthopedic-orthodontic treatment, the patient's Class I mutilated malocclusion was treated as shown in Figs. 10 and 11.

A. B.

C. D.

Fig. 6.—Patient G. G., July 26, 1956. *A*, Risser jacket in place, head extended, spine straightened. Chin deviation to right with positioner not in place. *B*, Risser jacket in place, head extended, spine straightened. Chin deviation corrected with positioner in place. *C*, Orbicularis oris exercise over positioner. *D*, Temporal-masseter exercise into positioner.

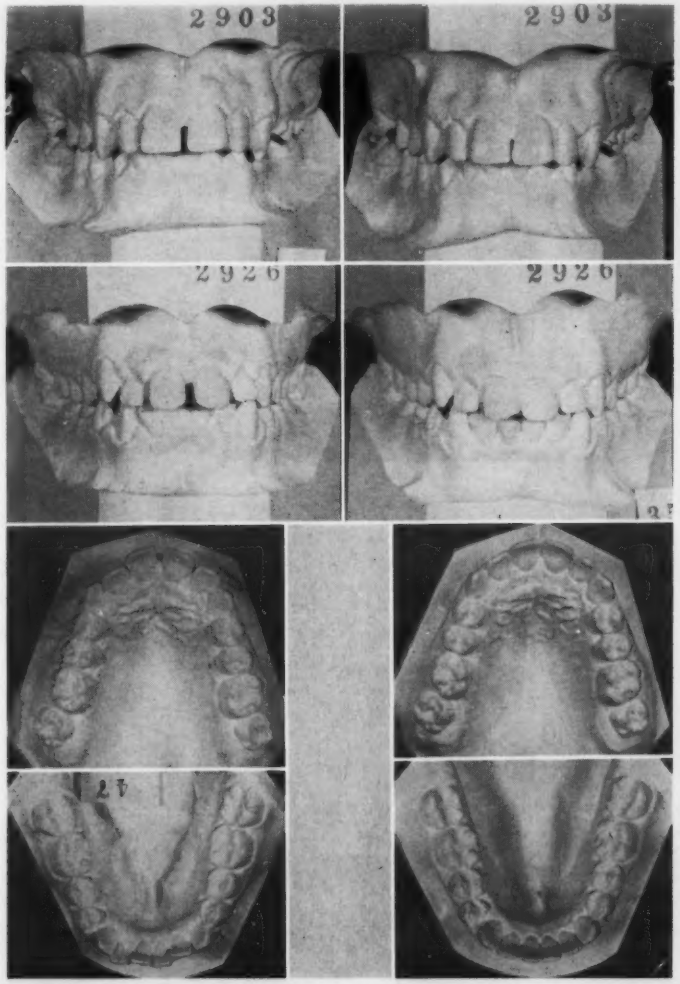
A.



B.

Fig. 7.—Patient G. G. *A*, Original malocclusion (May 31, 1956). *B*, Occlusion at end of treatment (March 17, 1958).

A.



B.

C.

D.

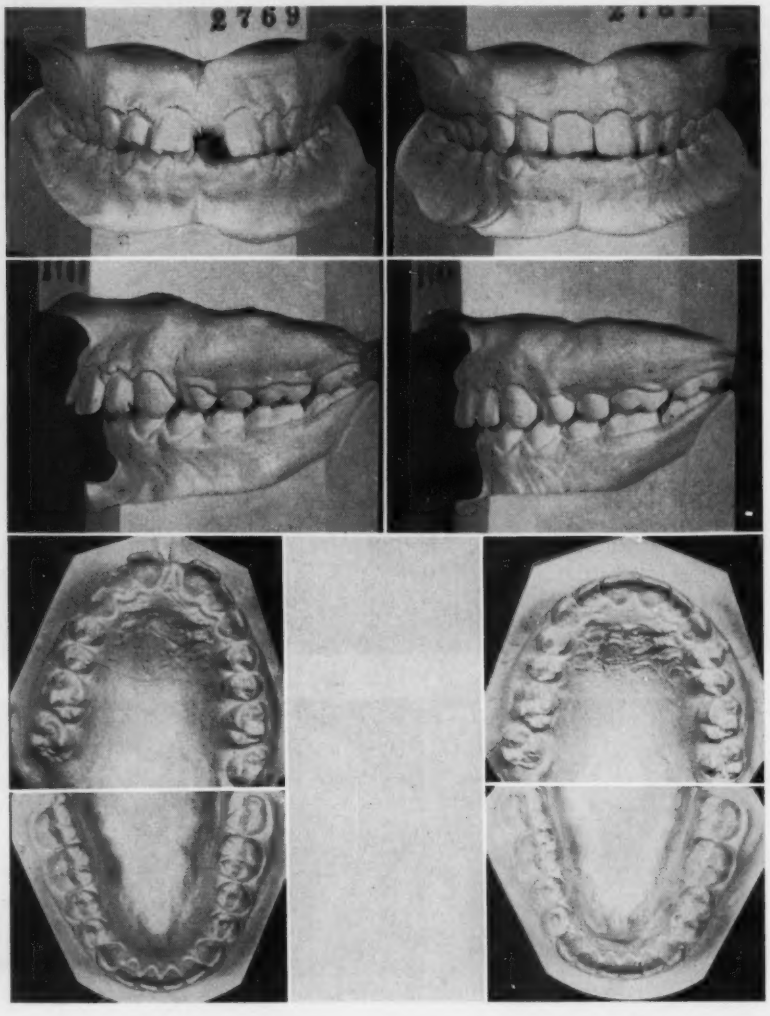
Fig. 8.—*A*, Patient F. M. (2903). *Left:* Original malocclusion (April 20, 1958). *Right:* Model made on Jan. 30, 1959, after correction had been made. Patient had worn Milwaukee braces and Risser jacket for nine months.

B, Patient J. C. (2926). *Left:* Original malocclusion (May 6, 1958). *Right:* Models obtained on Dec. 10, 1958, after correction had been made. This patient wore Milwaukee braces for ten months.

C, Photographs of Patient J. C. on May 6, 1958, with Milwaukee brace showing chin pad unilaterally against mandible.

D, Patient J. C. on Dec. 10, 1958, after final correction. This patient wore positioners and Milwaukee braces for nine months.

CASE 7.—Patient B. L., a girl aged 15 years 8 months, cooperated well during treatment while wearing numerous body casts and undergoing spinal fusions to gain a 35 degree spinal correction of scoliosis. The wearing of two positioners during twenty-five months of combined orthopedic-orthodontic treatment produced an improvement in this patient's Class II (Angle) malocclusion (Fig. 12).



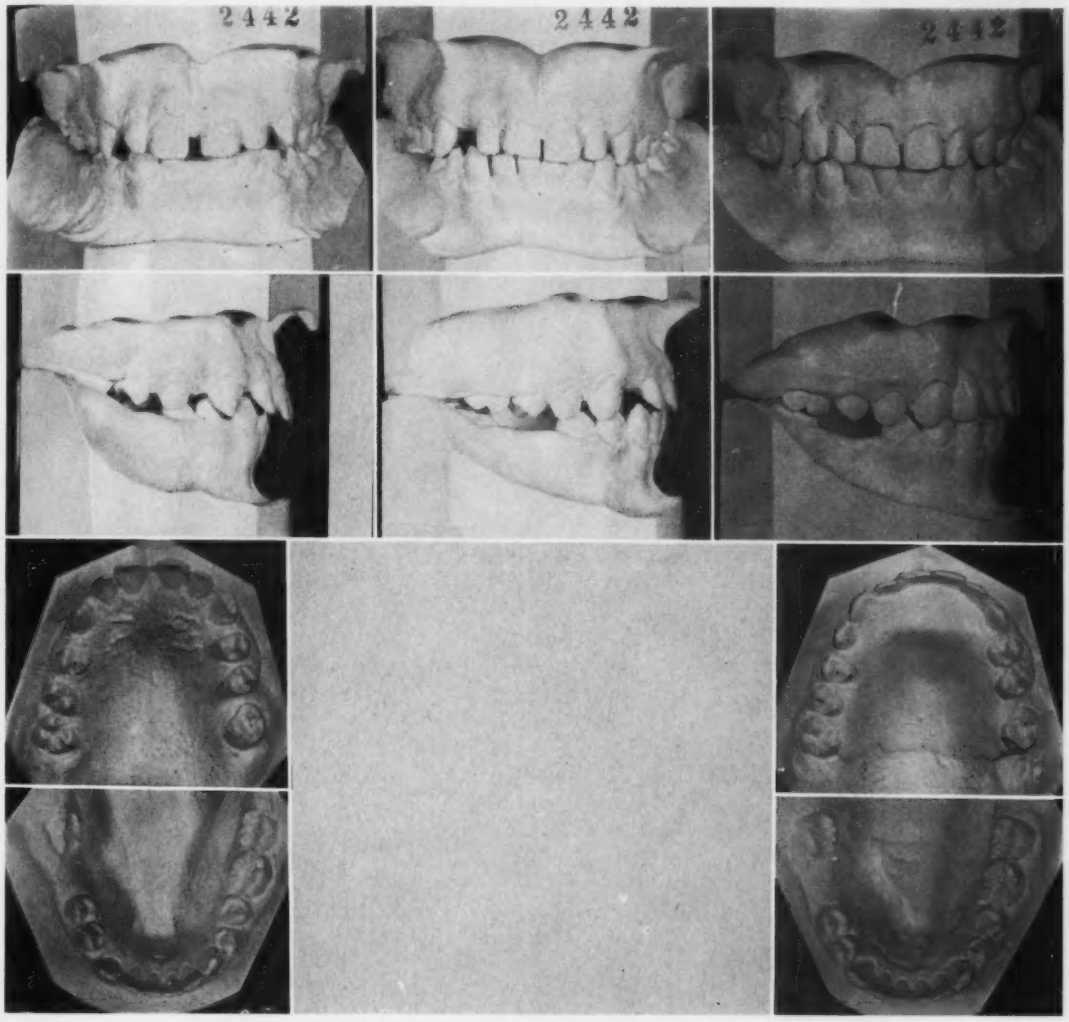
A. *B.*

Fig. 9.—Patient E. M. *A*, Original malocclusion on Aug. 25, 1957. *B*, Models obtained on March 19, 1959, after final correction. This patient wore positioners with Risser jackets and body casts for twenty-four months.

CASE 8.—Patient S. H., a girl 8 years 10 months of age, gave good to excellent cooperation (particularly during the later phases of treatment) while wearing numerous body casts, Risser jackets, and Milwaukee braces to obtain good spinal correction of a severe scoliosis with spinal fusions. Four positioners were worn during thirty-four months of combined orthopedic-orthodontic guidance to improve her Class I (Angle) malocclusion as shown in Figs. 13 and 14. Growth and development during this transitional period were anticipated in positioner setups to accommodate lateral and anteroposterior arch width and length changes.

CASE 9.—Patient M. B., a girl aged 14 years 4 months, gave excellent cooperation continually while wearing Milwaukee braces and undergoing a spinal fusion to gain a satisfactory spinal correction of scoliosis. The wearing of two positioners following extraction

of an impacted maxillary right cuspid and the mandibular right lateral incisor during seven months of combined orthopedic-orthodontic guidance improved this patient's Class I (Angle) malocclusion as shown in Fig. 15.



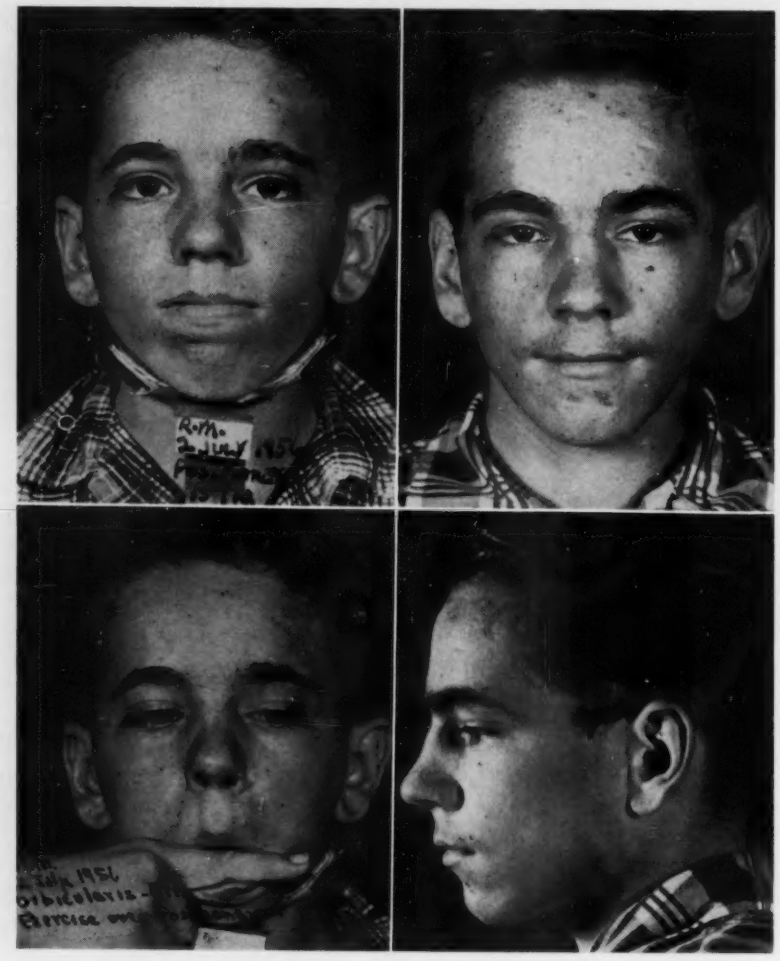
A. *B.* *C.*

Fig. 10.—Patient R. M. *A*, Original models obtained May 26, 1956. *B*, Progress models, July 8, 1958. *C*, Final models, Jan. 23, 1959. This patient was 14 years 3 months of age at start of treatment. Positioners were used for orthodontic treatment and Milwaukee braces for orthopedic treatment. Treatment time was 26 months; cooperation was intermittent.

Control Cases

CASE 10.—Patient D. S., a boy aged 5 years 11 months, cooperated well during early treatment when wearing first a Risser jacket and then Milwaukee braces and undergoing spinal fusions to obtain a 20 degree spinal correction of idiopathic scoliosis. Two positioners (incorporating expected lateral and anteroposterior transitional stage arch changes in the advance positioner setups) were worn during the first year of combined orthopedic-orthodontic treatment to improve a Class I (Angle) malocclusion with a strong Class II tendency (Fig. 16). Because of a change in residence, orthopedic treatment during the subsequent eleven months was conducted without the positioner. The malocclusion that developed during this eleven-month interval of orthopedic treatment with a Milwaukee brace and spinal fusion is also recorded in Fig. 16.

CASE 11.—Patient P. H., a girl 13 years 2 months of age, cooperated only fairly well and then not at all during treatment (a severe adolescent transition occurred) while wearing body casts and undergoing spinal fusions to gain a 30 degree spinal correction of idiopathic scoliosis. While the patient was not wearing three positioners (two of which were made with the intention of partially correcting the rapidly developing malocclusion which was



A. *B.*

Fig. 11.—Patient R. M. *A*, Pretreatment photographs made on July 2, 1956, show patient wearing positioner to support against Milwaukee brace which tilts head to left. *B*, Final photographs made on Jan. 23, 1959. This patient wore Milwaukee braces and positioners for twenty-six months.

appearing when the positioner was not worn with the initially placed body cast) during eleven months of combined orthopedic-orthodontic treatment, the Class II (Angle) malocclusion became more extreme, as shown in Fig. 17. Treatment was finally discontinued because of lack of cooperation from the patient.

CASE 12.—Patient S. S., a girl aged 14 years 7 months, gave irregular and then very poor cooperation during twelve months of combined orthopedic-orthodontic treatment while wearing body casts and undergoing a spinal fusion to obtain a 30 degree spinal correction of scoliosis. Four positioners were not worn, and a rapidly occurring protrusion and loss in vertical dimension became evident when the closely molded chin support of the body cast was unsupported by the patient's positioner. The Class II (Angle) malocclusion became

more pronounced, as shown in Fig. 17. Later, as treatment continued the patient became more cooperative and recovery (not photographically recorded) from the greater part of this resultant malocclusion was accomplished.

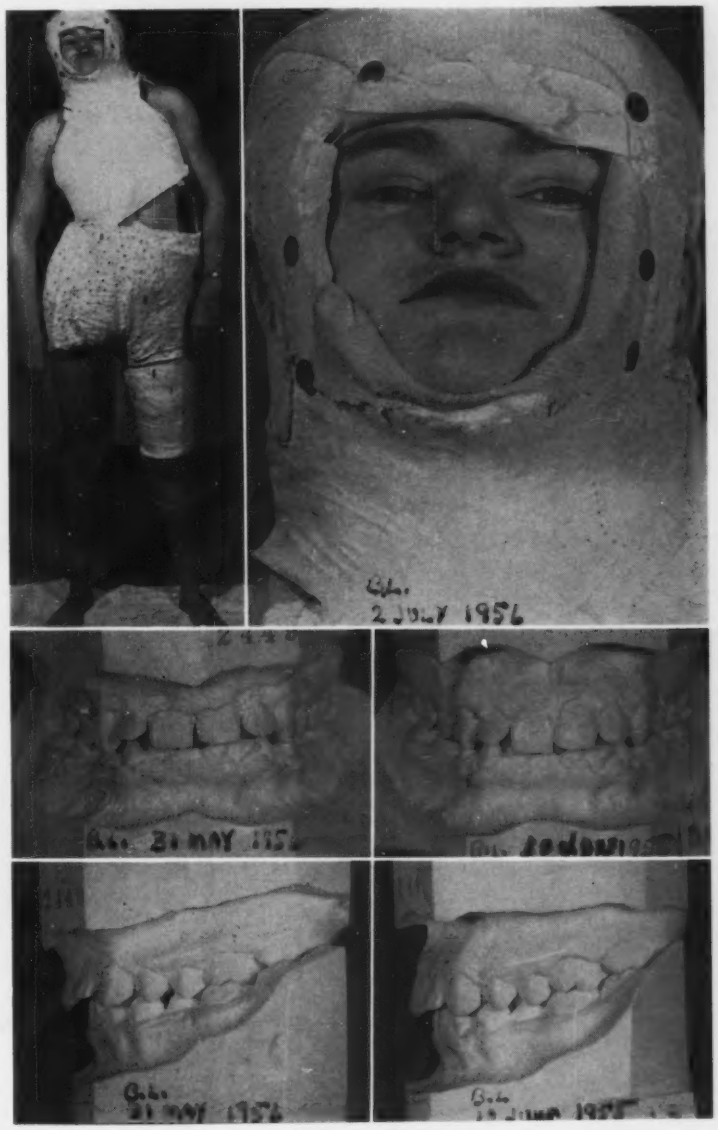


Fig. 12.—Patient B. L. *A*, Body cast and braces demonstrate lateral asymmetrical cast pressure against mandible and left side of face. *B*, Cranial part of cast assembly without positioner. Uneven shoulder level is demonstrated.

C and *D*, Models of Patient B. L. taken before treatment (*C*) and after treatment (*D*).

DISCUSSION

Individual Tooth Movement.—In addition to opposing cervical orthopedic cast or brace force, a dental positioner may constructively accomplish orthodontic movement simultaneously if good cooperation is received from the patient.

It is possible to improve or correct some dental malocclusions by making slight axial alignment changes (Case 7, Fig. 12), closing spaces (Case 6, Figs. 10 and 11), rotating teeth (Case 1, Figs. 2, 3, and 4), making depressions (Case 6, Fig. 11), increasing overbite (Case 8, Figs. 13 and 14), decreasing overbite (Case 1, Figs. 2, 3, and 4), decreasing overjet (Case 1, Figs. 2, 3, and 4),

Fig. 13.—Patient S. H. *A*, July 2, 1956. Patient as casted without dental positioner. Chin is deflected to right.

B, Position of patient as originally casted.

C, Patient as casted with dental positioner in place.

D, Head extended and forward up out of cast. Temporal-masseter exercise (with strong mentalis action) being done over positioner.

(Continued on following page.)

uprighting teeth (Case 6, Figs. 10 and 11), improving interdigitation (Case 9, Fig. 15), creating tipping movements (Case 7, Fig. 12) and bodily movements (Case 9, Fig. 15, correcting midline deviations (Case 5, Fig. 9), correcting irregular tooth positions (Case 1, Figs. 2, 3, and 4), correcting some cross-bites (Case 1, Figs. 2, 3, and 4), and, within certain limits, increasing vertical dimension (Case 6, Figs. 10 and 11).

The movements are most practical for patients whose orthopedic treatment plans call for long periods of wearing casts or braces. Orthodontists will recognize that such dental movements, along with positional or functional changes, must be within the patient's tolerance limits and within the elastic range of the

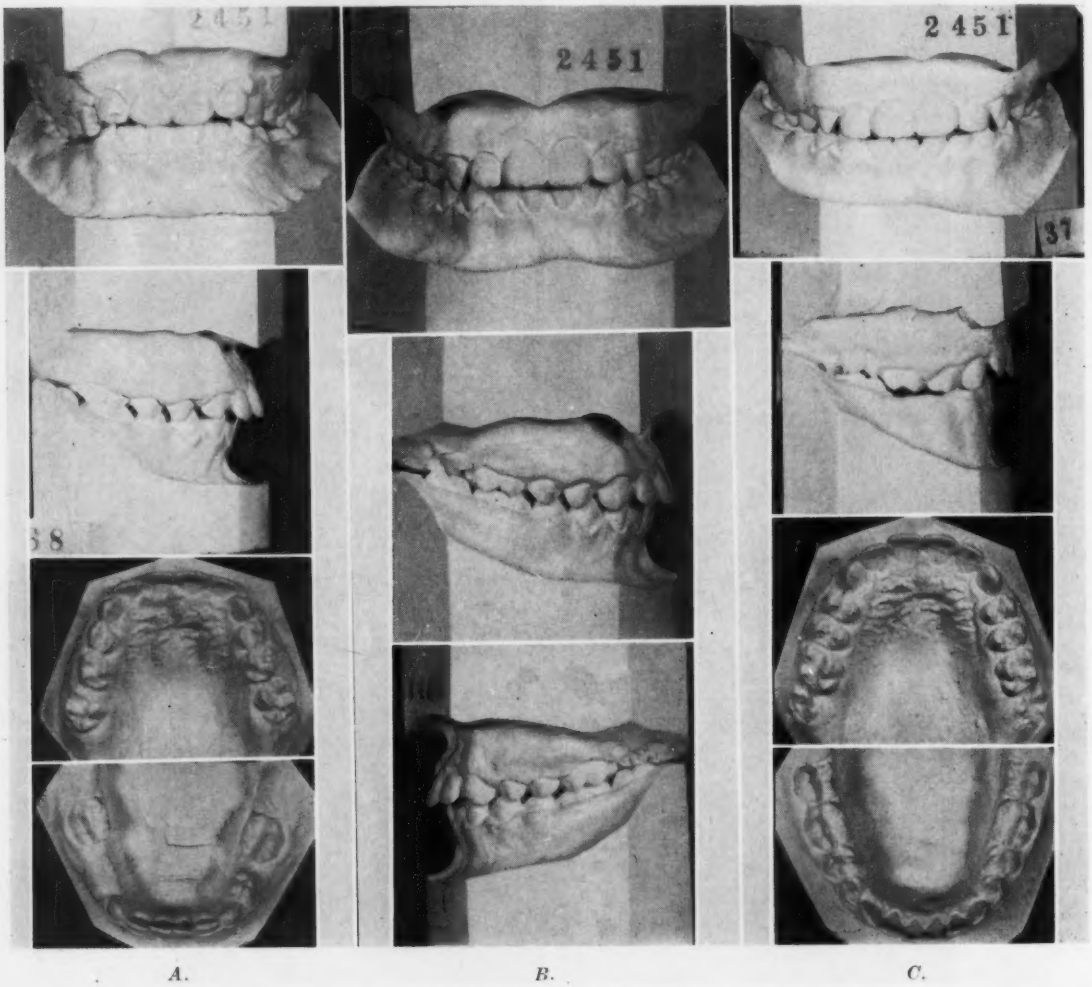
E. *F.*

Fig. 13 (Cont'd).—*E*, March 6, 1958, without positioner. Lateral and superior mandibular displacement to left is evident, with chest bar support being directed diagonally. Protrusive position of head with strong compression against inferior mandibular body evident.

F, March 12, 1959, without positioner. Complete lateral mandibular displacement to left is evident, chest bar support being vertical, with anterior mandibular protrusive component being introduced.

positioner. This positioner must cover all of the areas to be changed in the planned tooth repositioning. If attempted dental repositionings are beyond the stretch of an elastic positioner, the patient will be unable to seat the positioner or the positioner will be uncomfortable to wear. In these instances a patient cannot be expected to wear the positioner. Ideally, actual orthodontic repositionings, when set up in wax on the duplicate model prior to fabrication

of the positioner, must keep the teeth over basal bone (Case 1, Figs. 2, 3, and 4). Only minor movement from the original tooth position should be made. Limitations must be recognized in the changes attempted. The degree and extent of movements may be increased by means of a series of positioners (Case 1, Fig. 2, *B*, *C*, and *D*) graded to accomplish changes in stages.



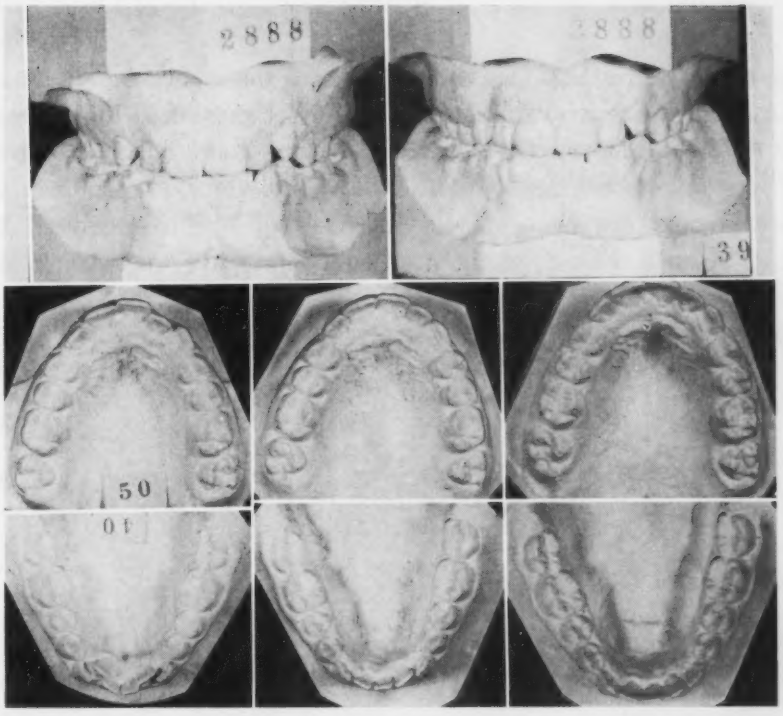
A. *B.* *C.*

Fig. 14.—Patient S. H. *A*, Original models made on May 31, 1956. An anterior tongue-thrust caused infraclusion of maxillary central and lateral incisors.

B, Progress models made on Feb. 4, 1959.

C, Final models made on June 27, 1959. Transition dentition was replaced by permanent dentition during treatment.

Cooperation and Responsibility of Patient and Parent.—When patients do not cooperate and an unfavorable labioversion of the anterior teeth develops (Fig. 17), it sometimes is possible afterward, with the patient's cooperation then being given, to make partial correction of the condition. In such instances, it is often necessary to have a series of positioners so constructed as to reguide the teeth into intermediate positions between this resultant malocclusion and the occlusion desired.



A. *B.* *C.*

D.

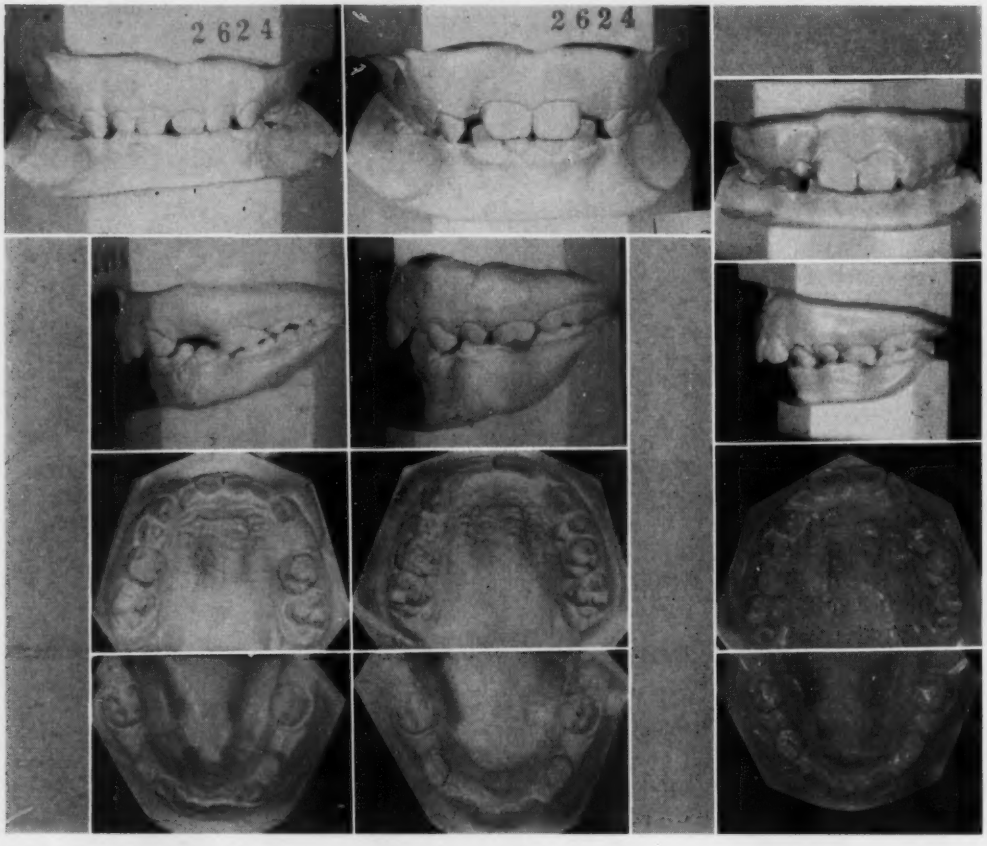
Fig. 15.—Patient M. B. *A*, Original models made on May 5, 1958. Impacted maxillary right canine and mandibular right lateral incisor were later extracted.

B, Progress models made on June 27, 1958.

C, Final models made on Dec. 10, 1958.

D, Photographs taken on Nov. 23, 1959, show head position changes and pressures applied to head by cast.

Difficulty is encountered in retaining corrections between various intervals of cast wearing and cast changing. Even if forewarned to the contrary, when a cast or brace is removed the patient and his parents may feel that it is unnecessary for him to continue wearing the positioner. Particularly when corrective movements are being made, correction previously gained or held is quickly lost (Case 5, Fig. 9) if the positioner is not worn between cast changes.



A. *B.* *C.*

Fig. 16.—Patient D. S. *A*, Original models made on April 17, 1957. With caries susceptibility high and oral hygiene poor, multiple deciduous extractions were done during treatment.
B, Progress models made on April 25, 1958. Positioners had been worn in conjunction with Milwaukee braces for past year.
C, Final casts made on April 1, 1959. No positioner was worn during past year, as wearing of Milwaukee brace continued.

At intervals of removal of the cast or brace during treatment, the attending orthopedic surgeon can help by making a further explanation to the patient and his parents, and advising the continued wearing of the positioner while the cast or brace is off. This is most constructive if tooth movement in conjunction with stabilizing of the denture has been the planned objective of orthodontic treatment in these orthopedic cases. It facilitates a continuation of the cooperation which is so vital to successful treatment with orthopedic appliances and the dental positioner. The orthopedic surgeon attending the

patient should be kept closely informed as to the necessity of the patient's constant wearing of the positioner. In turn, the orthopedic surgeon can enhance the positioner's effectiveness by keeping the attending orthodontist informed regarding proposed cast changes. Motivation of the patient is the basic factor in gaining cooperation during such intervals.

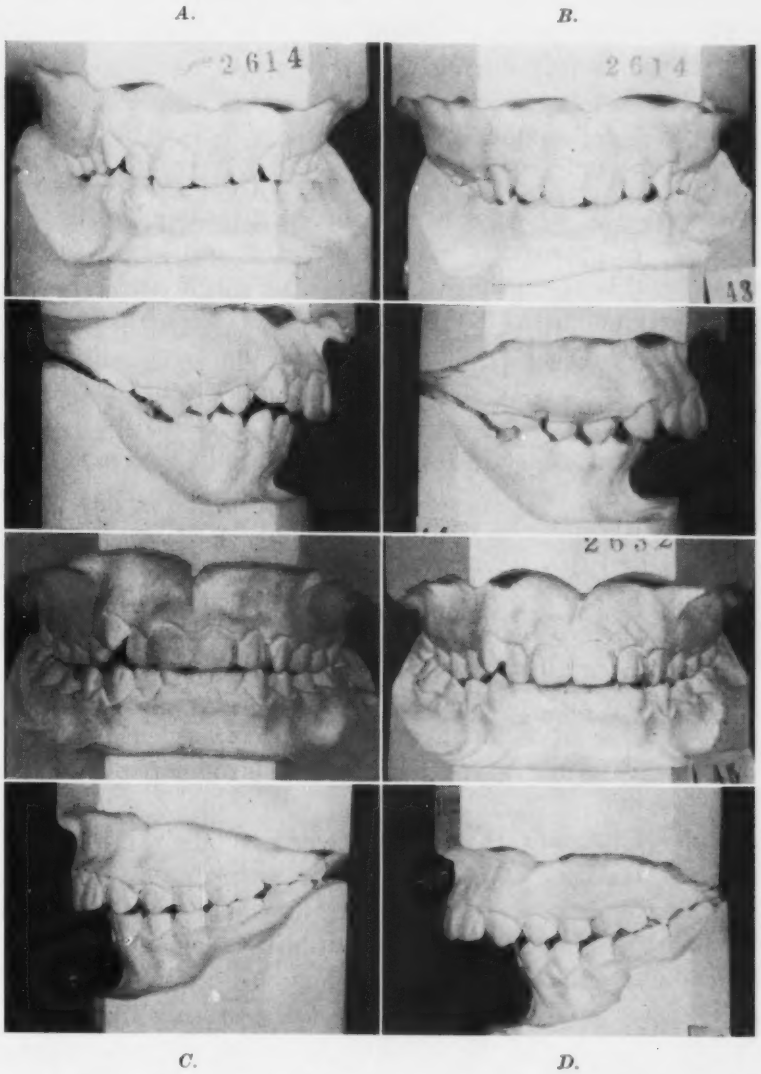


Fig. 17.—*A*, Patient P. H. Models made on April 17, 1958, showing original malocclusion. *B*, Patient P. H. Models made on May 28, 1958, show malocclusion that resulted from willfully not wearing positioner provided while casted with Risser jackets over eleven-month period.

C, Patient S. S. Models made on April 30, 1957, showing original malocclusion.

D, Patient S. S. Models made on March 26, 1958, showing increase in severity of malocclusion over an eleven-month period as patient (casted in a Risser jacket) refused to wear positioner properly.

Often several casts are required during the course of orthopedic treatment. The patient may be admitted to and discharged from the hospital several times during the course of a year or two of orthopedic treatment. This involves a transfer of responsibility in the patient's management from the nursing

staff to the parent. When the parent is fully instructed and cooperates conscientiously, this transition can be managed. Here motivation of the parent is the related factor.

Since, basically, patient motivation and cooperation keynote this entire treatment procedure, it is constructive to show the patient the setup model (Case 1, Figs. 2, 3, and 4) and to indicate the objective in the procedure being followed. The orthodontist may prevent failure by showing the patient (in advance of treatment and/or during the early stages of treatment, particularly if cooperation is not being given) a series of models of another patient who has not worn the positioner while wearing an orthopedic cast.

Orthopedic Appliance–Dental Positioner Interrelationship.—The Risser jacket, the chin pad of which is molded to the mandible and to the chin's contour (Fig. 4, *C*), is apparently a more powerful displacing force against the teeth than is the Milwaukee brace (Case 8, Fig. 13, *E* and *F*) which does not have such a closely molded chin cup.

A patient must be clearly informed that the teeth will be loose during treatment. For four to six days following placement of the positioner a patient will feel a slight soreness and mobility of the teeth. This is related directly to the amount of tooth displacement initially incorporated in the positioner setup and to the force of the patient's closure into the positioner.

It is constructive for the positioner to be placed five to seven days prior to placement of the cast. This has the advantage of having the patient's adjustment to the initial discomfort of tooth movement following positioner aplication completed before the cast is placed and it also facilitates better stabilizing of the mandible (into the positioner) at the time of casting. Another advantage to placing the positioner prior to casting is that the discomfort of the positioner and the adjustment to the cast are experienced by the patient at different times. This makes the entire procedure more comfortable for the patient.

It is vitally important that the patient have the teeth fully seated into the positioner at the time of casting. After a first cast has been placed, one should carefully observe at the time of subsequent cast placement whether or not the patient closes fully into the positioner. Some uncooperative patients have a tendency to withdraw the teeth from the positioner during placement of the second cast, having learned from the first casting that by so doing they will have greater mobility of the mandible following cast placement.

From the standpoint of spinal extension, the question of whether the positioner should be placed before or after the cast or brace is placed is open to postulation. In cases in which the positioner has been placed following the setting of the Risser jacket type of appliance (Fig. 4, *C*) a hurting in the occipital area against the border of the Risser jacket collar has been noted approximately twenty-four to forty-eight hours after placing of the positioner. With the mouth open approximately 2 to 3 mm. wider after the positioner is placed, the inferior border of the mandible will contact the cast or brace sooner. Therefore, the head is tipped posteriorly slightly farther than when the patient was first casted. As

a result, the occipital portion of the collar is prematurely contacted. Until the patient learns to extend the head slightly farther out of the collar and/or to tolerate the new pressure, there ensues a period of discomfort. Unless the adaptation of the Risser jacket collar has been extremely close, this should be tolerated by the patient.

At times during placement of a cast the mandibular position with respect to the maxillary position is incorrect. To avoid this, it has been found advisable for the positioner to be constructed and placed so that the patient is familiar with it and its use before the cast or brace is placed. When casting is done, it is advisable for the orthopedic surgeon to request the patient to close the teeth fully into the positioner and to keep the mouth firmly closed as the cast is being molded against the mandible and the mandibular rami. If the patient does not place the mandible fully into the positioner during casting, the mandibular position will not be correct with respect to the new predetermined tooth positions being sought by the positioner.

If mandibular position with respect to the cranium is incorrect and the patient becomes uncomfortable in one or both temporomandibular joints when occluding into the positioner following placement of the cast, a new cast may be placed or a compromise procedure of widening the chin cup of the cast anteriorly may be followed. It is also possible that the chin area and the flange extending laterally up the ramus can be altered. However, altering the cast usually reduces its stability at the cervical end. These procedures will ultimately result in less than the desired support for the mandible, reduce the cranial stability of the cast, and consequently make the dental positioner's action less effective. Then resetting is the preferred alternative.

General Findings.—During treatment with positioners where spaces are being opened for unerupted teeth (Case 1, Figs. 2, 3, and 4) or where erupting teeth are being guided into new positions (Case 8, Fig. 14), patients show a tendency not to close hard into the positioner. They explain that they do this because it is not completely comfortable to close hard. It may be necessary, as these teeth erupt, to concave the tooth position into the positioner so that channels are made to guide the erupting teeth into position.

Thompson[23, 25] and others have identified mandibular rest position as a position in which the teeth are not in occlusion but are apart 2 or 3 mm. Since dental positioners used are fabricated[8-11] in a simulated rest position, functionally the position in which the mandible is held by the positioner is a physiologically natural one and is comfortable for the patient. Function during temporomasseter exercising used during positioner treatment could be considered physiologic, since this exercise starts, just as mastication does, from a mandibular rest position.[19, 20, 23, 25-27]

Differential Diagnosis.—When a patient has already assumed a "convenience bite" on the side opposite the space where posterior teeth have been previously lost, there may well have already developed a midline deviation and an asymmetry of the maxillary arch with respect to the medium raphe. Lovejoy[13] reported seeing in many persons clinical asymmetry in maxillary and/or

mandibular arch size in the median sagittal, frontal, or Frankfort planes correlated with half of the body generally being asymmetrical in length, breadth, or width. This type of asymmetry should not be overlooked, but it should be clearly differentiated from the functional type of midline asymmetry related to cross-bites and shifting of tooth position following loss of teeth.

Ideally, preventing a dental malocclusion rather than correcting it after it has occurred would seem consistent with thorough orthopedic treatment planning and case management.

SUMMARY

1. This study was conducted for three and one-half years to determine the value of the dental positioner in conjunction with application of orthopedic casts and braces during orthopedic treatment of spinal scoliosis. The study included forty patients, aged 6 to 19 years, who were treated for intervals of from seven months to thirty-four months.

2. In thirty-five of forty cases treated during this study, satisfactory maintenance or improvement of dental occlusion was possible when positioners were worn properly in conjunction with orthopedic casts and braces placed by orthopedic surgeons treating scoliosis.

3. In two of the five cases in which the patient's occlusion demonstrated greater imbalance during orthopedic-orthodontic treatment, later cooperation from the patient and the parents made it possible for subsequent wearing of positioners to improve the undesirable malocclusion that developed during the first uncooperative part of treatment.

4. In three cases, in which cooperation was completely lacking during orthopedic-orthodontic treatment, satisfactory maintenance of dentofacial relationships and dental occlusion was not possible (Fig. 17).

5. Thirty-five of forty patients satisfactorily treated with orthopedic appliances and dental positioners worn simultaneously showed spinal curvature corrections ranging from 15 to 65 degrees along with constant or improved craniofacial relations and dental occlusion. The patients' cooperation here was satisfactory to excellent.

6. Good cooperation from the patient was a positive factor in cases where facial pattern and dental occlusion showed improvement in this orthopedic positioner treatment of scoliosis.

7. The study demonstrated that the use of a dental positioner for orthopedic patients, along with placement of an orthopedic cast or brace, was highly individual.

8. Results from this treatment procedure were more satisfactory when the dental positioner was inserted prior to placement of the orthopedic cast or brace.

9. A limitation in the extent of tooth movement possible with a dental positioner was recognized in this study.

10. Better gingival tone was noted in orthopedic patients wearing positioners as compared to other patients under similar orthopedic treatment who were not wearing positioners.

11. The patient's comfort is seemingly improved by the wearing of a positioner during placement of a body cast and brace in the orthopedic treatment of scoliosis.

CONCLUSIONS

1. Rubber dental positioners appear to play a valuable correlative role in orthopedic treatment of spinal scoliosis by maintaining or improving dental and craniofacial relationships and by preventing dental malocclusion during such orthopedic treatment.

2. Stability of orthopedic braces or casts in treatment of scoliosis is enhanced by constant wearing of the dental positioner.

3. Close cooperation of the patient, the parents, the attending orthopedic surgeon, and the nursing staff is vital to satisfactory dental positioner treatment during orthopedic treatment of scoliosis.

4. Repositioning of teeth, within physiologic limits and within the positioner's range of action, was shown to be possible in treated clinical cases.

5. Dental positioners were well tolerated by patients wearing orthopedic appliances during hospital and intermittent home treatment of scoliosis.

6. In this procedure treatment is directly under the patient's control, which must be recognized as being disadvantageous in principle.

7. Prevention of dental malocclusion by coordinating positioner wearing with orthopedic appliance application, particularly in growing children, would seem consistent with thorough treatment planning and case management in the orthopedic treatment of scoliosis. The elastic dental positioner affords a means, well tolerated by the patient, through which this may be accomplished.

ORTHOPEDIC GLOSSARY

Body cast—	A plaster cast covering parts or all of the legs, arms, trunk, back, and head.
Chin pad—	That portion of the orthopedic appliance that contacts the inferior mandibular body surfaces.
Collar (of cast or brace)—	That supporting part of the orthopedic cast or brace that contacts the occiput, inferior mandibular surface, and neck.
Degree of spinal correction (in scoliosis treatment)—	Vertical variation (improvement) in spinal position compared to the original, recorded in degrees.
Idiopathic scoliosis—	A pathologic lateral and rotary spinal curvature originating without apparent extrinsic cause.
Milwaukee brace—	An adjustable trunk-neck brace which applies traction and lateral pressures to the trunk; used to correct scoliotic deformities of the spine and then hold the spine in corrected position.
Orthopedic-orthodontic treatment (for scoliosis)—	In this study, the combined and simultaneous use of dental positioners with orthopedic appliance application during scoliosis treatment.
Risser jacket—	A plaster-of-Paris body cast applied in sections, extending from pelvis to skull and encompassing the head, neck, and trunk; it exerts traction longitudinally on the spine and provides lateral corrective pressure at the apex of the scoliosis; it is used to correct scoliotic deformities of the spine and to hold the spine in corrected position.

Scoliosis— Lateral and rotary curvature of the spine.
Spinal curvature— Malalignment of the spine.
Spinal fusion— A preliminary surgical uniting or joining together of two or more vertebral segments with bone grafts, usually performed to prevent recurrence or progression of scoliosis.

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OCULAR HYPERTELORISM OF GRIEG: A CONGENITAL CRANIOFACIAL DEFORMITY

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INTRODUCTION

OCULAR hypertelorism of Grieg, usually and inexactly called simply hypertelorism, is a rare congenital deformity of the cranial base and face. It is characterized primarily by an excessive spacing of the bony orbits (Fig. 2, *B*).

The word *Hypertelorism* is derived from the Greek *hyper* ("over, above"); *tele* ("far off"), and *ismos* ("condition"). Although defined as an excessive distance between any paired organs,[1] in actual use the term is confined to the orbits, in reference either generally to their excessive spacing or to the specific syndrome under consideration here. The syndrome is properly referred to as ocular hypertelorism of Grieg[2, 3] and is limited to that deformity in which the excessive interocular distance is primary and is not secondary to other deformities, such as facial or nasal clefts, frontal meningocele, encephalocele, or any of the other cranial dysostoses.[4]

HISTORY

Cases of this disease were described in the medical literature as early as 1593,[5] but it was not until 1924 that Grieg[2] described the condition as a distinct clinical entity and thus initiated a flood of published cases by other workers. The over-all pattern of these published reports over the next decade was generally one of casual collection of data with subjective evaluation, followed by considerable improvement in the quality of the literature.

Probably about two dozen English-language articles of merit have appeared in the literature. This scarcity of useful published information may be due in part to the rarity of afflicted patients as well as to the fact that treatment, instead of being unique, is similar to that applied to the more common facial and cranial deformities.

DESCRIPTION

Reilly[6] describes hypertelorism as "a developmental congenital anomaly of the lesser wings of the sphenoid bone. Owing to the excess growth of these

This thesis, which was given as a partial fulfillment of the requirements for certification by the American Board of Orthodontics, is being published with the consent and the recommendation of the Board, but it should be understood that it does not necessarily represent or express the opinion of the Board.

wings, the orbits are widely separated and the horizontal axes of the eyes are directed in a more lateral direction than is normal.'' The reference here, as are most of those in this report, is to ocular hypertelorism of Grieg. The bridge of the nose is usually recessive and the base is unusually wide, with a resultant retroussé or saddle-nose appearance. One case is reported in which a male patient, whose photograph at 1 year of age showed such a nose, had a well-formed nose with a high nasal ridge when he reached adulthood.[5] Occasionally the nose is bifid.[7] The cranial sutures are normal, whereas in the cranial stenoses proper they are closed. Associated deformities are fairly common, particularly those of the extremities, such as syndactylia. Other aberrations reported with regularity are oculomotor malfunction, mental defect, roentgenographic lacunae in the cranium, and ''high palate.'' To a lesser degree, auditory, renal, and ectodermal disturbances have been associated. It has been suggested that the condition ''predisposes to or may be connected with hypoplasia of the maxilla and of the whole skeleton.''[20]

The outstanding and definitive symptom is the excessive distance between the eyes, which in extreme cases can be so marked that the eyes appear to be located at the corners or even almost at the sides of the face. Binocular vision can be impaired, and strabismus is present in many of the severe cases. Reasonably accurate measurement of the distance between the orbits calls for use of the canthi rather than the pupils as points of reference. In defining hypertelorism, one critical authority[8] uses the following standards:

Condition	*Canthus Index**	*Circumference-Interorbital Index†*
Upper limit of normality	38	6.8
Euryopia‡	38-42	6.8-8
Hypertelorism§	42+	8+

Both indices are easily and rapidly measured and computed. The author of these standards feels that the circumference-interorbital index is the more valid but that a case of hypertelorism must qualify with both indices. However, it is more reasonable that the clinician who uses these standards is justified in using considerable subjectiveness in their application.

The roentgenographic appearance of cranial lacunae in many of the patients is of interest to the orthodontist in that, when present, they are quite obvious in the lateral cephalometric roentgenogram. A large sella turcica has been reported in one case,[9] but its significance (if any) is unknown.

Two true cases of ocular hypertelorism of Grieg have been described in detail at autopsy.[2, 5] Both showed gross morphologic changes, with the sphenoid bone the focus of the deformity and the adjacent facial and cranial bones necessarily also deformed.

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*Canthus index $= \frac{\text{medial canthus distance}}{\text{lateral canthus distance}} \times 100.$

†Circumference-interorbital index $= \frac{\text{interorbital distance (medial canthi)}}{\text{cranial circumference}} \times 100.$

‡Euryopia is an intermediate condition (stenopia being an abnormally small interorbital distance).

§Apparently the author feels the same standards apply both to "hypertelorism" and to ocular hypertelorism of Grieg.

ETIOLOGY

The condition of ocular hypertelorism of Grieg is one that is apparent in infancy[10] and often at birth, and it apparently persists throughout life. Little or nothing is known regarding the possibility of differential growth that could conceivably initiate, aggravate, or mitigate the deformity; nor are significant reports[2, 5] of longitudinal study found.

It appears that occasionally a hereditary factor of familial tendency is involved.[9, 11-14] Such a factor has been traced for as many as five generations.[5] The question of whether or not environmental influences are involved here has not been well studied as yet. Nevertheless, this apparent hereditary aspect has great practical significance in that it may lift the condition out of the freak category with ramifications both in the investigation of etiology and in the clinical handling of the personal as well as biologic problems of these patients.[15]

The majority of cases have not been found to involve any sort of hereditary aspect, and speculations as to other possible etiological factors are varied. Some have surmised possible association with median facial clefts and have commented on the resemblance to the embryonic face.[16, 17] The high palates often reported may be similar to those seen in two of our patients (Figs. 3, *C* and *D*, and 4, *B*), which clinically suggest a bony palatal cleft. Aborted twinning or a tendency toward twinning of facial structures has been suggested, with the occasional bifid nose cited as partial evidence.

It has been suggested that the occasional hereditary aspect may indicate that the cause of the deformity could lie in early commencement of ossification of the sphenoid bone and that some of the anomalies seen in the frontal and occipital regions may be the result of rickets.[5] Recent studies by Deuschele and Warkany[18] have involved the production of deformities of the craniums and extremities of rats through controlled nutritional deficiences.

As might be expected, suspicion has been directed to endocrine dysfunction and to renal dysfunction.[6, 19]

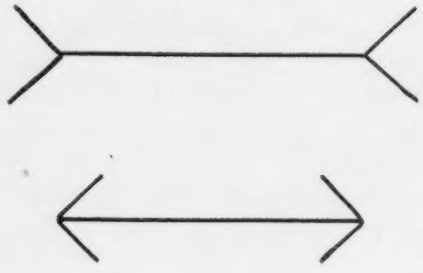
INCIDENCE

While cranial stenoses and other craniofacial dysostoses involving excessive interocular width, some of which are often inaccurately termed merely "hypertelorism," are rare and seldom seen by the orthodontist, cases of ocular hypertelorism of Grieg are even rarer. The only example that could be located in northern California with reasonable, though not exhaustive, effort is described in this report. Several cases were known to exist, but the patients could not be located by practitioners who had treated them. Perhaps the incidence of this deformity might be one in 100,000 births.

TREATMENT

Treatment of ocular hypertelorism of Grieg is symptomatic and involves many of the procedures that are used in the treatment of cleft lip and cleft palate.

Plastic surgery appears to be the most usual and helpful procedure in the treatment of any deformity of the nose. Medial extension of the eyebrows is relatively simple and very valuable cosmetically. In disguising the spacing of the orbits, an interesting application can sometimes be made of the following well-known optical illusion:



Visual and oculomotor disturbances are treated by the ophthalmologist, and the literature in this field is relatively complete.

The incidence or trend of malocclusion or dental defect is unknown, but "high palate" is commonly reported, and it is unlikely that dental and orthodontic care offers any new challenges.

CASE REPORTS

The first three patients described here were referred for orthodontic treatment, each with the simple diagnosis of "hypertelorism." Because of the orthodontist's early ignorance of the unique nature of the condition and his later desire to avoid calling unnecessary attention to the deformities of these patients, little more than the ordinary orthodontic examinations and records were made. No unusual nutritional, environmental, or hereditary background was noted or found in the medical histories.

CASE 1.—A girl, born April 13, 1945, was first examined in the orthodontic office when she was 8 years old.

When this patient was 2 years of age, a plastic surgeon made the diagnosis of hypertelorism with a large midfrontal meningocele, a turricephalic skull, multiple congenital deformities (including syndactylia) of the hands and feet, and a severely retarded mentality. When the girl was 5 years old, a neurosurgeon's examination revealed craniostenosis with increased intracranial pressure. Subsequently, multiple craniectomies were successfully performed.

Orthodontic examination at the age of 8 years showed an apparent maxillary retrusion as well as a mandibular protrusion, the negative incisor overjet being about 25 mm. A median palatal cleft, about 25 mm. long and 10 mm. wide, involved the posterior region of the hard palate and the anterior part of the soft palate, although the posterior border of the soft palate was intact and apparently functioning normally. The maxillary alveolar processes were enlarged, and the marginal gingiva was inflamed.

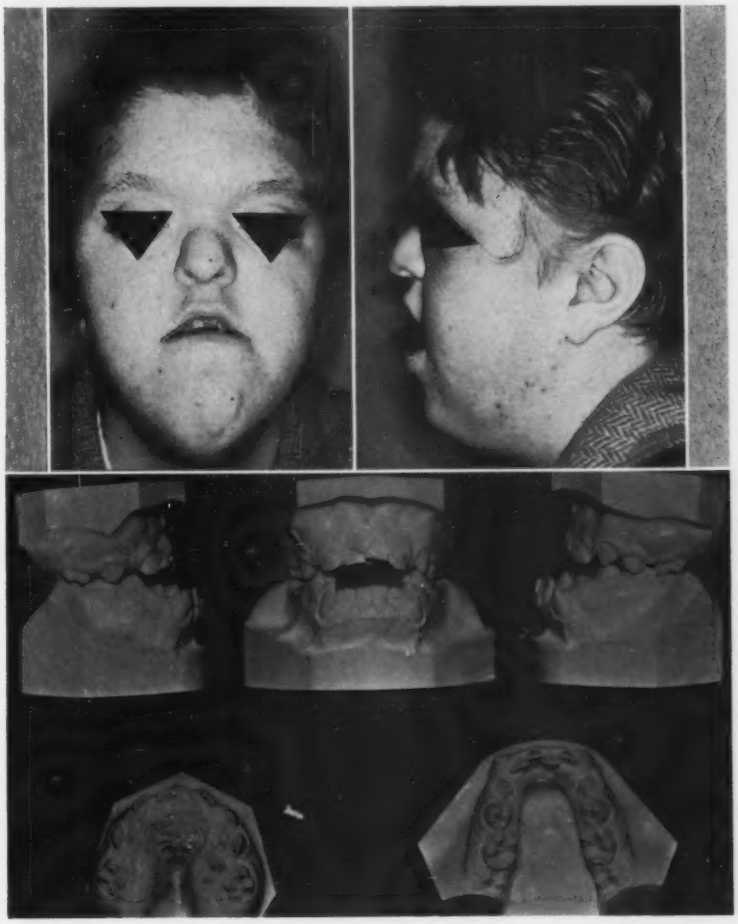
The development of the mandibular dental arch appeared normal, except for crowded incisors; the maxillary arch was very irregular, and no permanent teeth were erupted. The morphology of all erupted teeth was normal.

Intraoral roentgenograms indicated the presence and normal form of all mandibular permanent teeth, as well as normal bone density and trabeculation. All maxillary permanent

teeth were apparently present, but the unerupted central incisors had large and distinct lingual cusps. Inadequate roentgenograms of the maxillary area limited further visualization of these structures.

Cephalometric roentgenograms showed a shortened anterior cranial base, a shortened maxilla, possibly a slightly oversized mandible, and a very obtuse gonial angle. Obvious defects were visible in the cranium, upper face, cranial base, soft palate, and nasopharynx; the sella turcica was, in cross section, about three times the average area. Since the deformity was so gross, none of the cephalometric analyses could be applied.

A.



B.

Fig. 1.—*A* and *B*, Photographs and models of patient at 13 years of age.
(Continued on following page.)

The models made when the patient was 13 years old are shown in Fig. 1, *B*. Intraoral roentgenograms made at that time showed a diffuse radiolucency of unknown etiology in the periapical region surrounding the mandibular incisors. These films also revealed that the maxillary central incisors noted earlier were, in reality, supernumerary teeth with large dens in dente. Cephalometric roentgenograms (Fig. 1, *C*) showed that the deformity had increased in the preceding five years as a result of relatively retarded maxillary growth.

The orthodontist's initial diagnosis was "congenital defects of the bones of the cranial base and face resulting in severe malocclusion, with congenital cleft palate."

Treatment was held to the minimum because of the patient's inferior mental and social status and also because of the limitations imposed by the deformity. Suggested active orthodontic treatment or mandibular resection was rejected by the orthodontist, and care was limited to the recommendation that a palatal obturator be used and that selected teeth be removed to ease the crowding.

This is probably a case of dysostosis craniofacialis (Crouzon's disease) with the excessive interocular distance often found in this condition.

C.

Fig. 1 (Cont'd).—*C*, Roentgenogram made on May 1, 1953, when patient was 8 years of age.

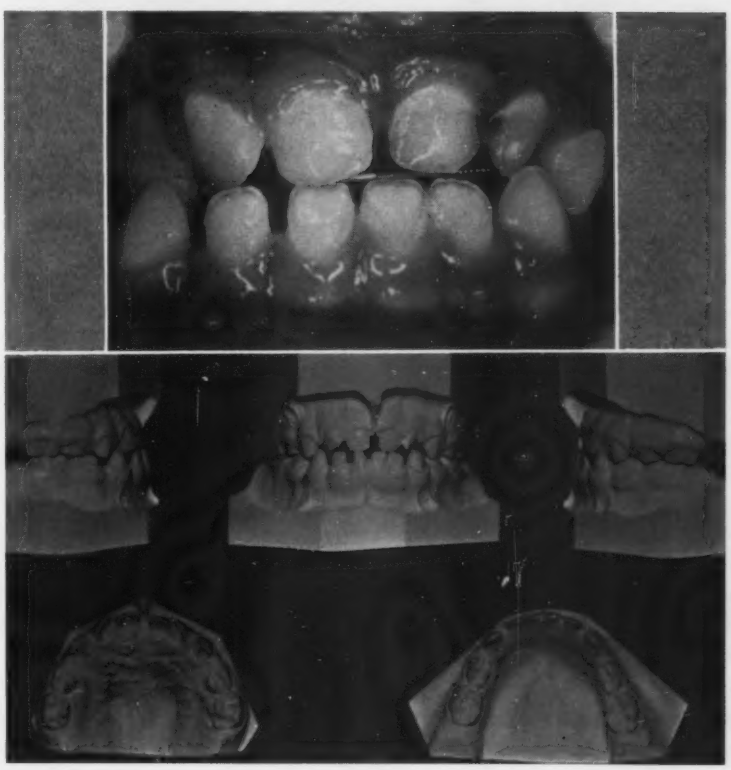
CASE 2.—A girl, born July 19, 1953, was first examined in the orthodontic office at 3½ years of age. Because of the patient's apprehension, however, a fairly adequate oral examination could not be made until she had reached the age of 4½ years.

When the patient was 14 months old, a plastic surgeon made the diagnosis of "a typical hypertelorism" with a very broad nasal bridge and bifid nose tip. The intercanthal distance was 1½ inches, and the interpupillary distance was 2¼ inches. At 27 months of age these measurements were 1¾ and 2½ inches, respectively; the lateral incisors were absent, eruption was slightly irregular, and there was a slight protrusion of the mandible. When the child was 28 months old an ophthalmologist made a diagnosis of intermittent exotropia of the left eye. When she was 4 years 4 months of age, the surgeon reported the measurements to be 1⅞ and 3 inches and stated that the greater development of the deformity

A.

B.

C.



D.

Fig. 2.—Case 2. *A* and *B*, Photographs of patient at the ages of 4 years and 4 years 10 months, respectively. *C*, Intraoral photographs at start of treatment, when patient was 4 years 10 months of age. *D*, Models after completion of cross-bite treatment.

(Continued on following page.)

was on the left side. At 5 years of age an ear, nose, and throat examination revealed chronic otitis media and some conduction hearing loss. A thorough ophthalmologic examination was made when the patient was 5½ years of age, and glasses were prescribed. At this time plastic surgery of the nose was undertaken.

E.

Fig. 2 (Cont'd).—*E*, Cephalometric roentgenogram made when patient was 4 years old.

Orthodontic examination at the age of 4½ years (Fig. 2, *A*) revealed that, except for the craniofacial deformity, the patient was an apparently normal child. Mentality and personality appeared to be normal, and speech was "normal." Except for one maxillary incisor, the full deciduous dentition was present. There was a slight maxillary contraction, with a consequent mandibular displacement to the right and a unilateral crossbite. The lower teeth were spaced more than normally, there was a tendency toward an anterior open-bite (the parents reported a thumb-sucking habit), and there seemed to be a slight mandibular protrusion. These oral conditions were rather mild in comparison to those usually seen by orthodontists and were not at all suggestive of any gross facial deformity. The cephalometric roentgenogram was correspondingly devoid of obvious defect (Fig. 2, *E*).

Because of problems in managing the patient, only a few intraoral roentgenograms were taken of the maxillary teeth in a search for caries, and impressions for models could not be made.

The orthodontist's diagnosis was initially that of a moderate malocclusion, probably caused by maldevelopment of the bones of the middle face and/or cranial base.

Orthodontic treatment was initiated at the age of 4 years 9 months, when the maxillary deciduous second molars were banded and a split lingual arch was placed to expand the maxillary dental arch (Fig. 2, *C*). Seven months later a chin cap was applied in the hope of retarding mandibular growth. The cross-bite treatment was uneventful and successful (Fig. 2, *D*) and was retained with a Hawley type of retainer. Cooperation in wearing the chin cap was poor, however, and the clinical impression at the time of the patient's most recent visit in June, 1959, was that the mandibular prognathism had become more severe. The patient's confidence and cooperation were achieved early in treatment but were lost shortly after bands were removed, very likely as the result of psychological trauma involved in plastic surgery on the nose. Models (Fig. 2, *D*) were made, however, and show the present occlusion. Extensive intraoral roentgenographic examination has been impossible and has been deferred until the patient again becomes amenable to these procedures.

It is anticipated that future orthodontic care will be of only average difficulty, with an average prognosis if the mandibular prognathism can be controlled.

This is a classic and pure case of ocular hypertelorism of Grieg, and it is as severe as the more extreme cases described in the literature.

CASE 3.—A girl, born May 13, 1946, was first examined in the orthodontic office at the age of 9 years (Fig. 3, *A* and *C*).

The patient was referred by her family physician to an experienced pediatrician, who examined her at 13 months of age and reported: "Malformation of skull, face, mouth and hand noted at birth. The skull was brachycephalic and turricephalic with partial closure of the coronal sutures; marked hypertelorism; narrow, high-arched palate, with irregular arrangement of the teeth; syndactylism of third and fourth fingers of left hand, with bifid distal phalanx of fourth finger." When the patient was 3 years of age, the cranium was operated upon to reduce the danger of increased intracranial pressure. It was reported that the operation was successful in this respect and that it also led to an improvement in the patient's appearance, probably as a result of improvement in the cranial contour. The hand was operated upon, with good results, when the patient was 4 years old. The general condition, development, and intelligence have always appeared to be satisfactory. No difficulties other than those noted above have been reported.

Orthodontic examination at 9 years (Fig. 3, *A* and *C*) indicated that the patient was a normal child except for the craniofacial deformity. Mentality and personality seemed normal, and speech was "normal" except for a slight lisping. The anteroposterior relationship of the dental arches was neutral. The mandibular arch was basically excellent, but the maxillary arch was very narrow and the palate was extraordinarily high (actually, about 10 mm. higher in the molar area than Fig. 3, *C* suggests, since the narrowness of the palate did not allow its accurate reproduction). An open-bite with tongue-thrusting was present in both the incisor and the mandibular deciduous molar areas. Each side of the palate presented an area of flabby soft tissue which was perhaps 3 mm. thick and centered midway between the palatal midline and the teeth.

The facial appearance is shown in Fig. 3, *A*. The examination record stated that the clavicles were not found upon palpation, an apparently inaccurate examination.

Intraoral roentgenograms indicated normal dentition and bone, except for ankylosed lower deciduous molars and what appeared to be a bony palatal cleft, about 3 mm. wide, lateral to the midpalatine suture and extending from about the distal border of the hard palate to the canine region.

Cephalometric roentgenograms revealed a mandible with a very obtuse gonial angle and a large Frankfort-mandibular plane angle. Although the entire crainum did not appear on the film, turricephaly was suggested, and lacunae appeared in the anterior portion of the cranium. The over-all appearance suggested excessive vertical growth of the face.

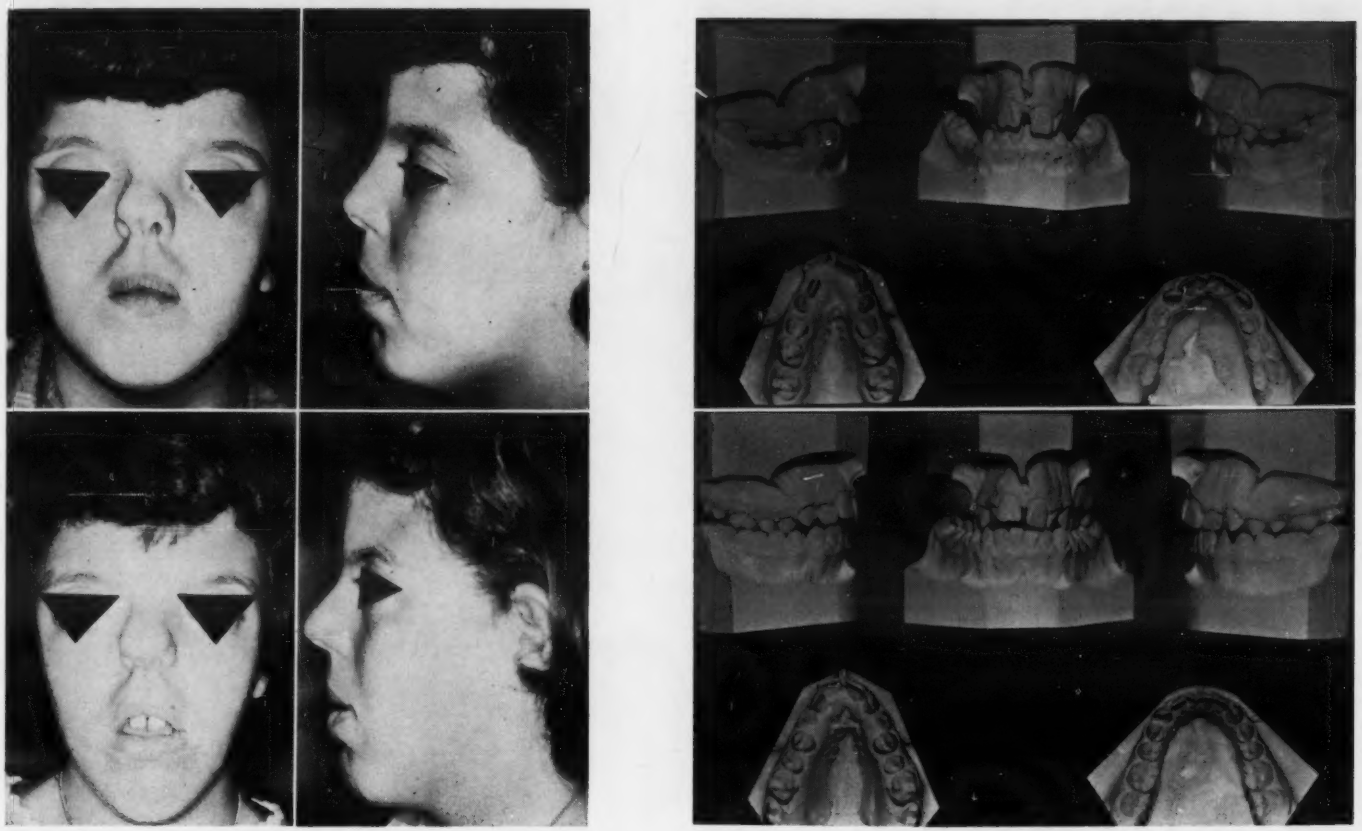


Fig. 3.—Case 3. *A* and *B*, Photographs of patient at the ages of 9 years 4 months and 13 years, respectively. *C*, Models made when patient was 9 years 4 months of age, before mixed-dentition treatment was started. *D*, Models made at the age of 13 years, before permanent-dentition treatment.

(Continued on following page.)

The orthodontist's initial diagnosis was cleidocranial dysostosis.

Treatment was undertaken immediately, with banding of all maxillary teeth except the deciduous canines and first molars; labial and lingual arches were used to expand the arch and align the incisors. After nineteen months these appliances were removed, and a simple removable acrylic appliance was placed to retain the expansion. Meanwhile, the ankylosed mandibular deciduous molars were removed and replaced with a functioning acrylic appliance to confine the tongue. This was discarded upon satisfactory eruption of the premolars. Myofunctional therapy of the tongue perversion was instituted, but it was soon withdrawn because of the patient's failure to cooperate in this aspect of treatment.

E.

Fig. 3 (Cont'd).—*E*, Roentgenogram made when patient was 13 years of age.

Permanent-dentition treatment was started when the patient was 13 years of age (Fig. 3, *D*, and *E*). It was found that the upper first permanent molars had been expanded 12 mm. with little tipping and that the other posterior teeth had erupted in a wider arch, thoroughly justifying the earlier treatment. The redundant palatal soft tissue seemed to have regressed in both thickness and area and appeared to have greater resistance to compression.

The intraoral roentgenograms showed normal dental and alveolar tissues, except for resorption of about 3 mm. of the root apices of the upper incisors; thyroid administration was deemed desirable in the hope of retarding further resorption. No roentgenographic or clinical study was made of the possible bony palatal cleft noted earlier. The clavicles were present and normal to palpation.

The open-bite (Fig. 3, *D*) now was confined to the incisor area. Most of the normal incisor overjet that had been orthodontically achieved had been lost because of lack of retentive treatment in this area.

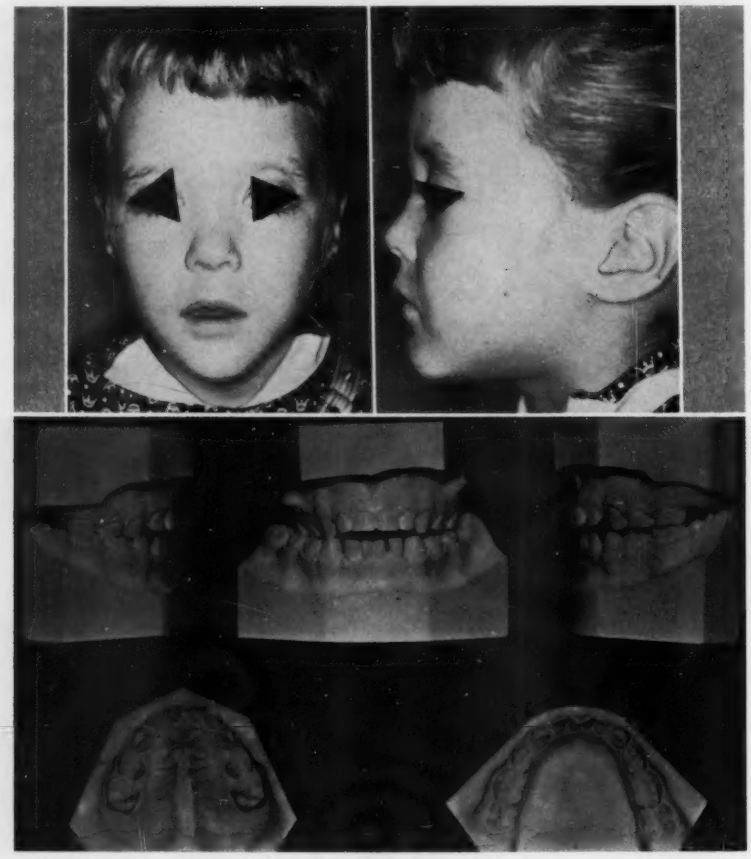
Cephalometric roentgenograms (Fig. 3, *E*) showed a marked and disproportionate increase in the vertical dimension of the face, and photographs (Fig. 3, *B*) showed a deterioration of the patient's appearance in spite of recent plastic surgery on the nose.

Permanent-dentition treatment was undertaken with an edgewise appliance on all teeth except the second molars, aided by a maxillary coil spring-loaded split lingual arch.

It is anticipated that treatment will progress rapidly and will be concluded with a normal dentition; however, it is expected that permanent retention of the expanded maxillary arch will be required.

Essentially, this is a case of craniostenosis (specifically turricephaly) with other defects, including excessive interocular width.

A.



B.

Fig. 4.—Case 4. *A* and *B*, Photographs and models, respectively, made when patient was 5 years 3 months of age, before treatment was instituted.

(Continued on following page.)

CASE 4.—A girl, born July 7, 1954, was first examined in the orthodontic office at the age of 4 years 10 months (Fig. 4).

The family dentist, a neighbor of the patient, had early noticed a peculiarity in the child's facial appearance, body conformation, and gait. Upon examining the patient in

his office when she was about 4 years old, the dentist was disturbed by the redundant palatal tissue (similar to that found in Case 3) and the suggestion of a bony palatal cleft. His models and description of the patient suggested to the orthodontist the possibility of a craniofacial dysostosis involving excessive interocular width. Later, the orthodontist's receptionist, after first meeting the child, remarked that she looked like "another hypertelorism patient."

The medical history as given by the child's mother was brief and uninformative, except for the fact that the mother had been about 50 years old at the time of the child's birth.

Orthodontic examination showed a child who was normal to casual observation, except for a mild physiognomic aberration that was evidently caused by a saddle-nose and widespread eyes. The mother later said that the mild underdevelopment of the nose was inherited.

C.

Fig. 4 (Cont'd).—*C*, Roentgenogram made when patient was 5 years 3 months of age.

The maxillary arch was contracted, with a bilateral cross-bite, and the incisor overjet was excessive. An open-bite in the incisor area, a tongue perversion, and a mild thumb-sucking habit were found. Intraoral roentgenograms showed that all was normal, except for moderate rotations of unerupted incisors and lower premolars. Cephalometric roentgenograms showed only a slight mandibular prognathism (in spite of the fact that the dentition was in an opposite condition).

The orthodontist's tentative diagnosis was mild ocular hypertelorism of Grieg or euryopia.

Orthodontic treatment has been initiated to expand the maxillary dental arch and at the same time to correct the mild anteroposterior malrelationship of the teeth. Prognosis seems excellent.

The diagnosis is unknown. There does exist, however, a generalized deformity of a mild degree.

DISCUSSION OF CLINICAL OBSERVATIONS

While only one case of ocular hypertelorism of Grieg could be located for examination, the other cases reported here had been erroneously diagnosed as such or as "hypertelorism" and are presented here as an aid in differential diagnosis. It is not known whether or not the contracted maxillary dental arch common to all four patients has particular significance, but this bears further consideration.

Partly because of limited facilities, but mostly in deference to the sensibilities of the patients, more exhaustive examination has not been undertaken. It is unlikely that additional information would result in any practical benefit for the patients concerned here.

A comparison of the foregoing cases is shown in Table I.

TABLE I

CONDITION	CASE NO.			
	1	2	3	4
Familial tendency				
Mental defect	x			
Exophthalmia	x	x	x	
Deformity of extremities	x		x	
Systemic disease				
Craniostenosis	x		x	
Roentgenographic cranial lacunae	x		x	
Cleft palate	x		?	
High palate			x	
Mesioclusion	x	x		
Distoclusion				x
Relative mandibular prognathism	x	x		x
Contraction of maxillary dental arch	x	x	x	x
Open-bite with tongue perversion	x	x	x	x
Excess palatal soft tissue			x	x
Gross speech defect	x			

X indicates the presence of the detail listed.

SUMMARY

The very rare congenital deformity of ocular hypertelorism of Grieg has been defined and differentiated. The relatively meager literature has been searched, and salient facts and opinions have been noted. Four clinical cases have been described from the viewpoint of the orthodontist. Although about one-third of the references consulted are cited, the works of Walsh,[17] Bojlen,[5] and Webster[7] cover the subject particularly well.

CONCLUSIONS

1. The terms *hypertelorism* and *ocular hypertelorism of Grieg* are usually confused with each other and are used with significant lack of care. The

former term should be discarded entirely and replaced by a suitable descriptive phrase, such as *excessive interocular width. Ocular hypertelorism of Grieg,* while ponderous, is a satisfactory name for the condition that is considered in this report.

2. Although ocular hypertelorism of Grieg can be a distinct clinical entity, its existence in all degrees and its close relationship (and even overlapping) with other craniofacial deformities must be recognized.

3. The symptom of excessive interocular width may occur in association with any of the craniofacial dysostoses.

4. The method of selection and the paucity of clinical material studied here, as well as the inadequate descriptions in the literature, preclude even a tentative conclusion regarding the relationship, if any, between the over-all deformity and any oral or dental defect.

5. Orthodontic treatment appears to be valuable when malocclusions are associated with gross craniofacial deformities.

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1213 14TH ST.

Editorial

FOREWORD

When a specialist in orthodontics has enjoyed many years of teaching experience on a university level, in both undergraduate and graduate areas, the impact of what he conveys to his students is interesting. When the teacher at the same time happens to be the immediate past-president of the American Board of Orthodontics (the accrediting agency of the American Association of Orthodontists), his opinions are of added interest for readers of the AMERICAN JOURNAL OF ORTHODONTICS. The editor requested that L. Bodine Higley, Professor of Orthodontics at the University of North Carolina, set forth his views in the editorial that follows.

ORTHODONTIC THERAPEUTIC FOLLY

AS FAR as can be determined, the orthodontist is the only member of the health services who deems it necessary to guarantee a permanent treatment result. This guarantee is entirely unwarranted unless it is known that all structures have been corrected to a state of acceptable equilibrium and that the etiological factors responsible for the original deformity have been eliminated.

The responsibility of maintaining the desirable result that has been achieved is further complicated by the apparent assumption that the original cause will never return or that an entirely new and different etiological factor will not produce a new deformity that is either similar to or quite unlike the original one.

Permanence of result is a desired goal of all orthodontic treatment, but unless the cause or the chain of etiological factors responsible for the original deformity can be discovered and eliminated, the most perfect correction is more or less doomed to relapse without permanent mechanical retention. The latter may or may not be feasible or possible. If the cause of the original deformity is entirely hereditary it cannot be eliminated, but by the time treatment has been completed some hereditary causes may not be potent enough to do further damage. The patient should be warned that some etiological factors cannot be determined and that others cannot be eliminated, even if known. He should be told also that, in spite of this, many deformities can be completely corrected or the conditions which they produce can be greatly improved, that many do not relapse, and that correction can be adequately maintained by comparatively simple retentive appliances.

Corrected deformities in other parts of the body usually need permanent retentive support, which is accepted by the patient if it is carefully explained before treatment is attempted. This also could be true with respect to orthodontic patients.

In all other branches of the healing arts the condition presented by the patient is treated, but no guarantee of a permanent result is offered. The orthodontist is fortunate that many results obtained are quite permanent and also that deforming etiological factors tend to be less devastating as the patient advances in age, unless they are of a potent pathologic or hereditary nature.

After a reasonable period of time, however, the orthodontist should be absolved of further responsibility unless permanent mechanical retention is instituted.

As in all other health services, it is important that the orthodontic patient be instructed to return at periodic intervals for further observation in order that the orthodontist may decide whether an etiological factor is again active in the production of a dental or dentofacial deformity, stop its progress if possible, and correct the abnormality if correction is deemed advisable. In other words, the patient should be subject to the same recall or periodic re-examinations expected in all other branches of the healing professions.

The orthodontist cannot continue to promise acceptable dentofacial relationships for the life of the patient as a result of a single orthodontic correction. Isn't it time that the orthodontist took a more realistic attitude toward the services that may be rendered? This should in no way reflect adversely on the fine and permanent results obtained for many treated patients.

L. B. Higley, B.A., D.D.S., M.S.

In Memoriam

H. B. BOLT

1879—1960

H. B. BOLT of Corpus Christi, Texas, formerly of Enid, Oklahoma, died on Nov. 29, 1960.

Dr. Bolt was born on March 6, 1879, in Clark County, Arkansas. In 1907 he graduated from Washington University School of Dentistry, where he was a member of Delta Sigma Delta fraternity. He did postgraduate work in orthodontics at Columbia University in New York City.

H. B. Bolt

Dr. Bolt practiced general dentistry in Amity, Arkansas, Fort Stockton and San Angelo, Texas, and Okmulgee, Oklahoma. In March, 1930, he moved to Enid, Oklahoma, where he practiced orthodontics until he retired in July, 1948. Dr. Bolt had maintained auxiliary offices in Alva and Stillwater, Oklahoma, until 1946. Upon his retirement, he moved to San Antonio and later to Corpus Christi, Texas.

Dr. Bolt was a member of the American Association of Orthodontists and the Southwestern Society of Orthodontists. He held life memberships in the American Dental Association, the Oklahoma State Dental Association, and the Northwestern District (Oklahoma) Dental Society. He had served as president and secretary-treasurer of the Northwestern District Dental Society.

In addition to his professional interests, Dr. Bolt was a very active member of the Oklahoma Philatelic Society, the Texas Philatelic Society, and the American Philatelic Society, and he had received several awards for his displays of stamps.

A member of the First Methodist Church, he was one of the founders of the Methodist Golden Agers in Corpus Christi and Kerrville, Texas. He was also a Master Mason and a member of the Hi 12 Club. He was a member of the Lions Club in Enid, and in Okmulgee, Oklahoma, he served as president of the Lions Club.

Dr. Bolt is survived by his daughter, Mrs. Glenn S. Woods of Corpus Christi, Texas, and a sister, Mrs. J. D. Eaton of Houston, Texas.

Dr. Bolt's death came as a severe shock to his many friends. Even after his retirement from orthodontics, his interest in and enthusiasm for his profession and its work never diminished.

George R. Webber, D.D.S.

THOMAS GUNTER DUCKWORTH

1888—1960

THOMAS GUNTER DUCKWORTH, pioneer Texas orthodontist, died in Boerne, Texas, on Dec. 30, 1960.

Dr. Duckworth was born in Siloam Springs, Arkansas, on Jan. 20, 1888. He attended grade school in Siloam Springs and later went to the Cherokee National Male Seminary in Talequah, Oklahoma, where his cousin, the late Will Rogers, was also a student. In 1912 he graduated from the Kansas City Dental College (now a department of the University of Kansas City).

For one year he was associated with the late W. J. Brady in the practice of orthodontics in Kansas City, and during that period he became a member of the first class of the Dewey School of Orthodontics.

In 1913 Dr. Duckworth located in San Antonio, Texas, where he became the first Texas dentist to limit his practice to orthodontics. Some six years later he was one of a group of eight who organized the Southwestern Society of Orthodontists. In 1920 Dr. Duckworth and T. O. Gorman formed a partnership for the practice of orthodontics. Dr. Duckworth retired from practice in 1951.

Dr. Duckworth was active in the Southwestern Society and lived to see its membership pass the 200 mark. He served as president of the Southwestern Society in 1924, and in 1957 he was presented with the Martin Dewey Memorial Award for outstanding service to the progress of orthodontics in the Southwest.

Dr. Duckworth was very active in civic affairs. He served on the Alamo Heights School Board for fifteen years, and for eight years he was chairman of the Board of Managers of the Robert B. Green Hospital. He was a member of the Rotary Club for over thirty years and was a 32° Mason. In addition to local civic and professional activities, he participated in professional activities at the state level. He served as president of the Texas Dental Association in 1940, and for several years before his retirement he was assistant editor of the *Journal of the Texas Dental Association.*

For recreation, Dr. Duckworth was an avid hunter. He was equally interested in the management of his ranch of more than 1,000 acres some 8 miles north of Boerne on the Guadalupe River.

THOMAS GUNTER DUCKWORTH

It was tragic that one who had been so active should be terribly crippled by arthritis during the last few years of his life. However, he was always optimistic and mentally alert, and he greatly enjoyed the many visits of his friends. Shortly after his retirement he shared the honor of a testimonial dinner given by the Southwestern Society of Orthodontists. This event, together with his annual birthday parties which many friends attended, was most helpful in maintaining his constantly optimistic good spirits.

There was an overflow attendance at the final service on New Year's Day. The floral tribute was very beautiful. Dr. Duckworth is survived by two

brothers, two sisters, two sons, and two grandchildren. Burial was at Boerne, Texas. *So mote it be.*

P. G. S.

RAYMOND L. WEBSTER

1893-1960

RAYMOND L. WEBSTER a prominent orthodontist in Providence, Rhode Island, died of a heart attack on May 14, 1960. He was 67 years of age.

Dr. Webster was born in Providence and received his early education there. He was a graduate of the Harvard Dental School. During World War I he went to France as a regimental dental surgeon with the 66th Coast Artillery; he was discharged as a captain.

RAYMOND L. WEBSTER

Dr. Webster was a faculty member of the Postgraduate School of Orthodontics at Harvard Dental School for many years. He was instrumental in establishing the Orthodontic Clinic at Rhode Island Hospital, Samuels Dental Infirmary, and had served on the infirmary's staff for ten years. He also had been a member of the orthodontic staff of Forsyth Dental Infirmary in Boston.

Dr. Webster was a past president of the Rhode Island State Dental Society, the Northeastern Society of Orthodontists, and the American Board of Orthodontics.

He was a Fellow of the American College of Dentists and an active member of the American Dental Association and the American Association of Orthodontists.

Raymond Webster was interested in all phases of life and was active in the Turks Head Club, the What Cheer Lodge, the Royal Arch Chapter of Providence Council, Calvary Commandery and Palestine Shrine (Masonic units). He was also a member of the Providence Art Club and the South County Art Association. He was a member and former Commodore of the Saunderstown Yacht Club and a veteran member of the Board of the Willet Free Library in Saunderstown. He was chairman of the Building Committee of St. Martin's Episcopal Church in Providence when the church was completed. At the time of his death, he was a member of St. John the Divine Church in Saunderstown and was a past Senior Warden of that church.

Surviving are his wife, Elsie Graves Webster; two sons, H. Macy Webster of Saunderstown and Raymond L. Webster, Jr., of Providence; a daughter, Mrs. Irving C. Sheldon of North Kingstown; and nine grandchildren.

Dr. Webster was always such a vital and interested member of our Society, as well as a leader, that he will be sorely missed. His active participation in all Society activities has always been an inspiration.

THEREFORE, BE IT RESOLVED that this Society place on record its appreciation of his services and express its sorrow in the loss sustained, and be it further

RESOLVED that a copy of these resolutions be forwarded to the bereaved family as evidence of our sympathy and spread in full upon the minutes of the Society.

(Unanimously adopted at the fall meeting of the Northeastern Society of Orthodontists, Nov. 14 and 15, 1960.)

BERNHARD WOLF WEINBERGER

1886-1960

THE Northeastern Society of Orthodontists deeply regrets the passing of Bernhard Wolf Weinberger, orthodontist and historian, at the age of 74.

Dr. Weinberger graduated from the University of Pennsylvania Dental School and did graduate work at the Angle School of Orthodontia. He was a pioneer in this field, lecturing at the University of Pennsylvania and the Baltimore College of Dental Surgery on orthodontic history.

Dr. Weinberger wrote several books, the best known being *Introduction to the History of Dentistry* (Mosby, 1948) and *Orthodontics, an Historical Review*

of its Origin and Evolution (Mosby, 1926). He was the author of many scientific papers and articles on dental history. He also wrote a biography of Pierre Fauchard.

As founder, in 1930, of the United States Section of the International College of Dentists, he was for many years vitally interested in this organization.

Combining his hobby with his profession, dentistry, he had served as Chairman on History of the American Dental Association and chairman of a similar committee of the Dental Society of the State of New York. He also had been president of the New York Society of Dental History and Culture.

He was a Fellow of the American Association for the Advancement of Science and a member of the Bibliographical Society of America and the American and New York Societies of Medical History.

In 1946, he wrote a tribute to Milo Hellman, a friend and professional associate. He closed the article with the following paragraph by Darwin, which may aptly be applied to Bernhard Wolf Weinberger:

> My success as a man of science, whatever this may have amounted to, has been determined, as far as I can judge, by complex and diversified mental qualities and conditions. Of these, the most important have been—the love of science, unbounded patience in long reflecting over any subject, industry in observing and collecting facts, and a fair share of invention as well as of common sense. With such moderate abilities as I possess, it is truly suprising that I should have influenced to a considerable extent the belief of scientific men on some important points.

THEREFORE, BE IT RESOLVED that the members of the Northeastern Society of Orthodontists do hereby express their highest esteem and gratitude for his services; that his example, contributions, and spirit will forever remain one of the brightest pages in the history of our pioneers who laid the foundations of orthodontics; and

BE IT FURTHER RESOLVED that a copy of these resolutions be forwarded to the bereaved family as evidence of our sympathy and be spread on the minutes of the Society.

(Unanimously adopted at the fall meeting of the Northeastern Society of Orthodontists, Nov. 14 and 15, 1960.)

Department of Orthodontic Abstracts and Reviews

Edited by
DR. J. A. SALZMANN, NEW YORK CITY

All communications concerning further information about abstracted material and the acceptance of articles or books for consideration in this department should be addressed to Dr. J. A. Salzmann, 654 Madison Avenue, New York.

Abstracts of Papers Presented Before the Research Section of the American Association of Orthodontists Washington, D. C., April 26, 1960

The Effectiveness of Posthypnotic Suggestion Upon Control of the Tongue-Thrusting Habit in Relation to Trance Depth: By George Lynn Palmer, D.D.S., M.S., University of Tennessee, College of Dentistry, Memphis, Tennessee.

The effectiveness of posthypnotic suggestion in controlling the tongue-thrusting habit which occurs during the act of perverted swallowing was appraised in relation to trance depth.

The thirteen patients included in the study were able to arrest the tongue-thrusting habit after four to five hypnotic sessions. A mean of one hour and twenty-one minutes was spent with each patient during the hypnotic sessions.

Each case was evaluated clinically, cephalometrically, and statistically. The difference between the original and final measurements in each case was attributed to the correction of the tongue-thrusting habit and to the subsequent partial spontaneous self-correction of the existing open-bite and overjet relationship, except in those cases in which orthodontic movement of the incisors was involved.

The range, mean, standard deviation, and standard error of the relationship of the maxillary central incisor to SN, the mandibular central incisor to FH, difference in overjet, and difference in overbite were calculated for each patient. The "t" test was applied to determine whether a significant difference existed between the original and final linear and angular measurements. A significant difference was found at the 2 per cent (.02) level.

Regardless of the trance depth achieved, no additional fortification was necessary to maintain the stable result after the tongue-thrusting habit was arrested. At the termination of the study, none of the patients in whom tongue-thrusting was arrested had relapsed. The mean number of days the habit had been arrested was 315 per patient. No relationship could be demonstrated between the trance depth and the correction of the tongue-thrusting habit.

434 LOCHWOOD VILLAGE
DALLAS, TEXAS.

A Growth Study in Ramus Height: By William Gene Schneider, D.D.S., M.S., University of North Carolina, School of Dentistry, Chapel Hill, North Carolina.

A lateral roentgenographic cephalometric investigation was undertaken on twenty-four white boys and twenty-two white girls at least 8 years of age but

not yet 9. All were of Northern European ancestry and were selected on the basis of their particular age and the fact that they were not receiving orthodontic treatment.

Each subject was oriented in a Higley head positioner for an open-mouth profile roentgenogram on two separate occasions, the second following the first by six months. Each roentgenogram was subsequently traced, and the linear measurement to be considered was recorded.

A statistical analysis was made of the differences in the two measurements for boys and girls.

The ramus height of the male is larger than that of the female at age 8, and there is no significant difference in growth increment between males and females for the six-month interval studied.

Growth trends were not apparent from this study, because of the comparatively short time interval of the two measurements on each group. These data, however, will serve as a base line for the longitudinal study projected.

45 Davie Circle
Chapel Hill, N. C.

A Study of the Stability of Orthodontic Treatment: By Werner Martin Pfluger, D.D.S., B.S., M.S., University of Tennessee, College of Dentistry, Memphis, Tennessee.

A critical analysis was made of the stability of twenty-one treated cases from the time retention was initiated to a time no less than six months after all retention was discontinued.

Tracings were made from lateral cephalometric roentgenograms. One tracing was made at the time of retention, and another was made during the postretention period. The average length of time that the patients studied had been out of retention was twenty-three months.

The following angular measurements were made on each film: S-N-a, S-N-b, a-N-b, $\overline{1}$ to mandibular plane, $\underline{1}$ to SN, $\overline{1}$ to Frankfort horizontal plane to mandibular plane.

The following linear measurements were made on each film: NP to $\underline{1}$, NP to $\overline{1}$, overbite, and overjet.

Plaster casts made at the time the patients were placed in retention and casts made at the time of this study were used. The following linear measurements were made on each mandibular cast: intercanine width, intermolar width, and inside arch length.

A statistical analysis was performed to evaluate the significance of the measurements obtained. This included the arithmetic mean, the standard deviation, the standard error, and the range. The "t" test was used to ascertain the significance of any differences found in the data. The 5 per cent level was selected as the division between significant and nonsignificant differences.

Minor but significant changes were found in the following measurements: S-N-b, a-N-b, $\underline{1}$ -NS, overbite, mandibular intermolar arch width, and mandibular arch length.

In the group of patients studied, the changes that occurred in the positions of the teeth during the postretention period were minor and did not destroy the functional or cosmetic benefits of the treatment; therefore, the results of the cases studied were considered stable.

611 West 15th St.
Austin, Texas

Dental and Basal Arch Measurements and Relationships: By J. Edward Gilda, A.B., D.D.S., M.S., and Raul Orillac, D.D.S., Eastman Dental Dispensary, Rochester, New York.

Orthodontic casts and lateral cephalometric roentgenograms of ten adults with excellent occlusions were obtained. The general level of the root apices was estimated from the cephalograms and scribed onto the casts by a special pantograph, which also traced the extent of the basal arch. The most buccal limits of the dental arches were traced by an optical method. Area measurements from the two tracings were used to establish quantitative relationships. In the second method, the limits of the dental and basal arches were marked on the casts with fine copper wire; roentgenograms were taken of the casts and tracings were made. A line connecting the distal contact points of the first molars was used as the posterior limit on all the tracings. The respective areas contained within the limits of the dental and basal arches were measured with a planimeter. Agreement between the two methods was good. The ratio $\frac{\text{basal arch}}{\text{dental arch}} \times 100$ was established for each case. The range was 82 to 98 per cent for the maxilla, with an average of 89 per cent, and 107 to 128 per cent for the mandible, with an average of 113 per cent. Another ratio, $\frac{\text{mandibular basal arch}}{\text{maxillary basal arch}} \times 100$, resulted in a range of 97 to 120 per cent, with an average of 106 per cent. Finally, the ratio $\frac{\text{mandibular dental arch}}{\text{maxillary dental arch}} \times 100$ yielded a range of 80 to 89 per cent, with an average of 84 per cent.

The mandibular basal arch was relatively much larger than the maxillary basal arch. This may be accounted for by a true morphologic difference and/or a masking of the bony configuration by muscle attachments. The relative size of upper to lower dental arch is consistent with common experience.

The ratio of maxillary basal arch to dental arch was plotted against Howes' analysis of tooth material to its supporting bone. No correlation between the two quantities was noted. Apparently different characteristics were measured by the two methods. Finally, large deviations from normal patterns were demonstrated in the case of certain malocclusions.

Changes in Denture and Skeletal Patterns Occurring During and Following Serial Extraction: By Thomas Woodson Rowan, D.D.S., M.S., University of Tennessee, College of Dentistry, Memphis, Tennessee.

The purpose of this study was to analyze some of the changes in the denture and skeletal patterns which took place during and following the serial extraction procedure.

Fifteen cases which had been treated by the serial extraction procedure were examined. The cephalometric x-rays taken before treatment were compared to those taken after treatment.

As a control, fifteen cases which could have benefited from serial extraction but did not receive the service were chosen. These cases had Class I molar relationships and were characterized by severe crowding in the anterior regions.

Angular and linear measurements were made to determine the changes which occurred during the serial extraction procedure. The linear measurements consisted of overjet, overbite, GoGn to $\overline{1}$ (measurement of a line perpendicular to GoGn which passed through the incisal edge of $\overline{1}$), $|\overline{6}$ to GoGn (measurement

of a line perpendicular to GoGn which passed through the mesiobuccal cusp of $|\overline{6}$). The angular measurements consisted of $\overline{1}$ to GoGn, $\underline{1}$ to $\overline{1}$ to NS, the a-n-b difference, $|\overline{6}$ to GoGn, GoGn to SN, and FMIA.

A comparison was made between the pretreatment and postreatment records of the serial extraction group. A "t" test was conducted on each of the comparisons to determine their level of significance. The significant differences were overbite, overjet, $\underline{1}$ to $\overline{1}$, a-n-b, GoGn to $\overline{1}$, and $|\overline{6}$ to GoGn.

A comparison was made between the posttreatment records of the serial extraction group and the control group. A "t" test was conducted on each of these comparisons to determine their level of significance.

Significant differences were discovered in the overjet and the vertical level of $\overline{1}$ as determined in the linear measurement of incisal edge of $\overline{1}$ to GoGn. The overbite increased significantly, while the overjet decreased significantly.

TEMPLE, TEXAS.

A Study of the Correlations of Some Vertical Facial Components in Males Possessing Class II, Division 1 Malocclusions: By Alex Calvin Shotts, D.D.S., M.S., University of Tennessee, College of Dentistry, Memphis, Tennessee.

The purpose of the study was to determine the effects of orthodontic treatment upon certain vertical facial components in males possessing Class II, Division 1 malocclusions.

Lateral cephalometric roentgenograms of twenty-one white male patients, taken before and after satisfactory treatment of Class II, Division 1 malocclusions, were used in the study. Various types of mechanotherapy were used in treatment.

Measurements, in tenths of millimeters, were made from nasion, along the facial plane, to perpendicular lines drawn to the facial plane at the levels of the anterior nasal spine, the lowest level of the upper lip, the incisal edges of the maxillary and mandibular central incisor teeth, and gnathion.

For each measurement the mean, standard deviation, and range of measurements were computed. Each measurement was then converted into a percentage of total facial height which was considered to be from nasion to gnathion.

The "t" test was employed to determine the significance of differences existing between mean ratios of vertical facial heights, as determined in the untreated and treated Class II, Division 1 malocclusions and in excellent occlusion cases.

Using a 95 per cent level of confidence, the "t" test showed no significant differences between the ratios of the vertical height in the three groups.

500 H WOODROW WILSON AVE.
JACKSON, MISS.

Lip and Cheek Musculature in Relation to Skeletal Structure and Denture: By Isaac Abrams, D.D.S., and Wendell Wylie, D.D.S., University of California School of Dentistry, San Francisco, California.

An impression method was developed for relating the musculature of the lips and cheeks to the hard tissues of the mouth. Alginate impressions of the vestibule showed the areas of origin, course, and relative strength of the buccinator, masseter, quadratus superioris and inferioris, triangularis, mentalis, and orbicularis oris muscles. Photographic superimposition related the impression to the denture.

Correlation of the musculature to the skull was achieved by cephalometric means. A buccal shield was constructed of wax and carefully extended to points of muscle attachment. By palpation, muscle origins were recorded on the wax, as were the lip line and angle of the mouth. These landmarks were outlined in the wax with brass ligature wire. Standard cephalometric roentgenograms were taken with the shield in place.

The method was applied to a study of forty children recruited from the orthodontic clinic waiting list. The resultant information was organized and recorded in a manner which would facilitate statistical analysis of the following subjects: (a) relationship between the shape of the dental arches and the outline of the maxilla and mandible at points of muscle attachment; (b) coincidence of some irregularities of the teeth, such as labioversion of the upper molar or cuspid, with recognizable muscle configurations; and (c) changes in the relationship between soft tissue, skull, and denture resulting from orthodontic treatment.

Behavior of Soft-Tissue Components of the Face as Revealed by Physiographic Cinematography: By Robert Elliot Rosenblum, B.S., D.M.D., Eastman Dental Dispensary, Rochester, New York.

Physiographic cinematography is a method for oriented and standardized recording of functional changes in the surface topography of the face. Standard slide projectors have been modified and stabilized to project grid lines on the subject's face. These result in contour lines when photographed at right angles to the projector axis. Standard reference planes are used to orient the subject's head. A 16 mm. motion picture camera is used to photograph the patient's face during the various functions. Both a frontal and a lateral series are filmed. The resulting motion picture film is spliced into a loop of a given function for normal speed, slow motion, and frame-by-frame analysis using a modified analytic projector.

Frame-by-frame analysis permits an evaluation of degree of movement and degree of contour change against a time base. Subjects with severe malocclusion, cleft palate, and/or cleft lip, as well as those with good occlusion, are being studied by this method. At present, attention is being centered on changes in surface topography during deglutition, but records of speech and mastication are also being obtained for future study.

Some of the questions which this study is attempting to answer are the following:

1. What is the relationship, if any, between the malocclusion and/or congenital defect and the perioral muscle behavior pattern? In other words, does the subject have an abnormal behavior pattern of his perioral musculature (including the so-called perverted or visceral swallowing activity)?
2. Is there a greater incidence of a characteristic behavior pattern in those with severe malocclusion and/or congenital defect than in those with good occlusion?
3. What is the effect of orthodontic, surgical, or prosthetic treatment upon an abnormal perioral behavior pattern?

Data utilizing this technique are being gathered and evaluated and should prove valuable in an analysis of the functional activity of the soft-tissue components of the face.

A Study of Buccofacial Tissue Dynamics as Related to Tooth Alignment: By Bruce B. Snyder, D.D.S., M.S.D., University of Nebraska College of Dentistry, Lincoln, Nebraska.

The purpose of this investigation was to:

(a) Determine the extensibility properties of buccofacial tissue in the maxillary premolar area.
(b) Determine the force (magnitude) exerted by the buccofacial tissue at rest on the buccal surface of the maxillary premolars.
(c) Demonstrate the effect of the force value described above on the alignment of the first premolars.
(d) Demonstrate buccal tooth movement due to lingual muscular forces.

Utilizing a specially designed lever-weight deformation apparatus, forty-eight Caucasian subjects, 9 to 56 years of age (six female), produced extensibility curves under progressive load increments of 25 grams to a total of 200 grams.

Extrapolation of the extensibility curves produced a mean value of 6.75 grams, which was converted to a resting buccofacial tissue force in pounds per square inch.

The concluding portion of this study was devoted to measurement of tooth movement. Two first premolars, diagnosed for orthodontic extraction, were relieved on their mesial, distal, and occlusal surfaces; one premolar was increased in buccolingual width by placement of a gold onlay on the buccal surface, the other premolar received an onlay on its lingual surface. The contralateral first premolars were used as controls. Forty-eight measurements were taken at three-day intervals.

The following observations were noted:

1. The extensibility curve of the cheek as measured in the maxillary premolar area is nonlinear and hyperbolic in form. This curve does not conform to Hooke's law but approximates a logarithmic function.
2. Tooth movement as a result of buccal tissue force was demonstrated (0.013 inch in forty-eight days).
3. Tooth movement as a result of lingual muscular force was demonstrated (0.009 inch in forty-eight days).
4. The buccal tissue force demonstrated in this study was found to be approximately 0.29 psi (28 gm./sq. cm.) through extrapolation. This rest muscle force value is light by comparison to "active" lingual force values suggested in previous studies.
5. Buccal tissue force is basically light and continuous in action, limiting lateral (buccal) tooth position and over-all arch form.
6. It can be assumed that tooth position is in a state of equilibrium, by virtue of the fact that disruption in buccolingual tooth dimension brought about an adjustment in alignment.
7. In this study the unmodified (control) teeth held a relatively constant equilibrium position.
8. Unknown forces, greater than the forces applied by either the lingual musculature or the buccofacial tissue, were observed to be operating in this study. These unknown forces did affect tooth alignment, counteracting lateral tooth movement (buccal or lingual) but permitting or effecting mesial and distal tooth adjustment.

201 East C St.
McCook, Neb.

News and Notes

American Association of Orthodontists 1961 Annual Meeting

Preparations are continuing for this year's meeting of the American Association of Orthodontists which will be held April 16 to 21, 1961, at the Denver Hilton Hotel in Denver, Colorado. A detailed program appeared in the January issue of the JOURNAL, but we take this opportunity to remind A. A. O. members that the following scientific papers will be presented:

PRINCIPLES OF CRANIOFACIAL DEVELOPMENT ASSESSED BY EXPERIMENTAL BIOLOGY (the John Valentine Mershon Memorial Lecture). Louis J. Baume, D.M.D., M.S., Geneva, Switzerland.

RECENT DEVELOPMENTS IN BIOLOGICAL STUDIES ON THE OSSEOUS SYSTEM. C. Willet Asling, M.D., Ph.D., Berkeley, California.

RESEARCH AND MALOCCLUSION. Stanley M. Garn, Yellow Springs, Ohio.

USES AND LIMITATIONS OF ELECTROMYOGRAPHY IN THE QUANTITATIVE STUDY OF SKELETAL MUSCLE FUNCTION. Henry J. Ralston, Ph.D., San Francisco, California.

SYSTEMIC DISTURBANCES IN RELATION TO GENERAL AND DENTOFACIAL GROWTH AND DEVELOPMENT IN CHILDREN. John F. Crigler, Jr., M.D., Melvin I. Cohen, D.M.D., and M. H. Wittenborg, M.D., Boston, Massachusetts.

SECOND AND THIRD MOLARS: THEIR ROLE IN ORTHODONTIC THERAPY (A. B. O. thesis). Malcolm R. Chipman, Spokane, Washington.

In addition, there will be a panel discussion of the above essays, a round-table discussion of "Systems Versus Basic Principles in Orthodontics," and general and registered-attendance clinics.

Other traditional features of the meeting will include the annual Golden Anniversary Luncheon, presentation of the Albert H. Ketcham Memorial Award, a round-table luncheon, presentation of the Milo Hellman Research Award, and a number of pleasant social events.

American Association of Orthodontists Registration of Guests at Annual Meeting

To ensure full participation of all active members of the American Association of Orthodontists, the following classification of nonmembers eligible to attend and schedule of attendance fees, which will be charged at the time of registration, have been established for annual session of the Association at the Denver Hilton Hotel in Denver, Colorado, April 16 to 21, 1951.

A. *No Attendance Fee.*

1. Full-time teachers in university dental schools.
2. Full-time graduate or postgraduate students in university orthodontic departments. It will be necessary to present a letter from the dean of the school certifying the status of the student.
3. Dentists from outside Canada or the United States of America who are members of recognized dental or orthodontic organizations.

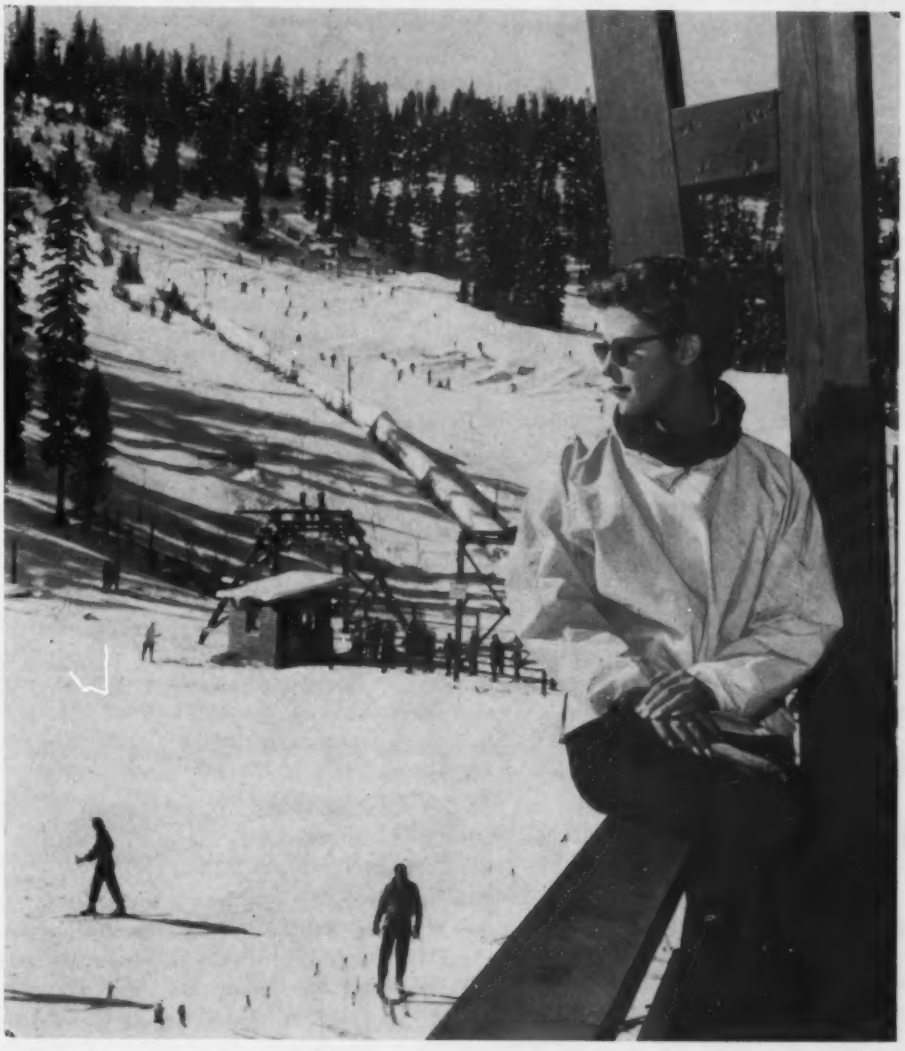
4. Regular and associate members of the A. A. O.
5. All wives in attendance.

B. *Attendance Fee—$10.00.*

1. Graduates (within the past three years) of university orthodontic departments who are in Government service.

C. *Attendance Fee—$50.00.*

1. Graduates of University orthodontic departments who are not members of constituent societies of the American Association of Orthodontists.
2. Other guests.



From the observation deck of the lodge at Winter Park, Colorado, Janet Writer (Mrs. Russell Writer, Jr.) of Denver rests while she watches other skiers. Winter Park is close to Denver and provides slopes and snow conditions for all types of skiers, from novice to expert. (Photograph by Charles Grover, courtesy Colorado Ski Information Center, operated by the Denver Convention and Visitors Bureau.)

Applications for guest privileges should be in the hands of the Credentials Committee sixty days prior to the annual meeting, and preregistration of such guests shall be compulsory.

As published in the JOURNAL, those persons who would be classified under the heading of C-1 or C-2 above are required to apply to the chairman of the Credentials Committee at

least sixty days before the session for proper forms, which required (a) written endorsement by two active members of the A. A. O. in the applicant's vicinity, (b) that the applicant be a member in good standing of the American Dental Association, and (c) that the applicant never has been rejected for membership in any of the constituent societies of the A. A. O.

Those persons who would be classified under the headings of A or B are required only to submit credentials identifying themselves as being in one of these categories at the time of registration. Registration under categories C-1 and C-2 will be limited in keeping with available facilities and accommodations.

Note: Associate members of the A. A. O. now come within a separate category covering membership in constituent societies and are no longer regarded as guests. Therefore, no fee will be required for persons in this category.

George E. Ewan, Credentials Chairman
Bank of Commerce Bldg., Sheridan, Wyo.

International Orthodontic Society for Research

The first meeting of the International Orthodontic Society for Research will be held at 10 A.M. on Sunday, April 16, 1961, in the Silver Room of the Denver-Hilton Hotel, Denver, Colorado. A paper entitled "Evolution of the Head" will be presented by William Straus, Jr., Professor of Anatomy and Anthropology, Johns Hopkins University. This paper will be discussed by Bertram S. Kraus, University of Washington, and Melvin L. Moss, Columbia University.

This meeting is open to all members of the American Association of Orthodontists.

Great Lakes Society of Orthodontists

The thirty-first annual meeting of the Great Lakes Society of Orthodontists was held Nov. 27 to 30, 1960, at the Hotel Netherland-Hilton in Cincinnati, Ohio.

The meeting began on Sunday evening, November 27, with an informal cocktail hour where friends met again after a year's interim, exchanging news, renewing friendships, and forming new friendships. Dinner and a party for those caring to attend were held at the Beverly Hills Country Club.

The society breakfast and first business session were held on Monday morning. The blessing and invocation was pronounced by Rev. Allen Person.

President H. Irving Miller opened the business meeting. He introduced Dr. James Hartman, Vice-President of the Ohio State Dental Association, who extended greetings. The President's address was followed by the usual order of business.

The first session of the scientific program was presided over by Richard Beatty. Cecil Steiner of Beverly Hills, California, presented a paper entitled "Cephalometrics as an Aid to Plan and Assess Orthodontic Treatment." This was followed by a paper entitled "Mandibular Ostectomy and Osteotomy" by Robert Ponitz of Ann Arbor, Michigan.

William R. Humphrey of Denver, Colorado, president of the American Association of Orthodontists, addressed the group at the Fellowship Luncheon.

Paul Ponitz presided over the afternoon session, at which Robert Moyer of Ann Arbor, Michigan, spoke on "Control of Anchorage and Retention in Extraction Cases" and Sidney Asher of Chicago, Illinois, presented a paper entitled "Extra Oral Traction Therapy."

Table clinics were held Monday evening. These were presented by members and by some of the essayists supplementing their oral presentations. This was followed by the gala "Over-the-Rhine" party.

An innovation, the American Board Breakfast, started Tuesday's activities. Arthur Lewis presided over the breakfast, and Edward Martinek of Detroit, Michigan, a past president of the American Board of Orthodontics and of the American Association of Orthodontists, was the speaker.

James Reynolds presided over the scientific session on Tuesday morning. David Hamilton of New Castle, Pennsylvania, presented a paper on "Thumb Sucking—Facts, Fictions, Permissive Treatment." The second speaker was Cecil Steiner, who continued with the subject that he had opened on Monday morning.

The Past President's Luncheon on Tuesday was well attended.

Herbert Frankel presided over the Tuesday afternoon session. Joseph Jarabak of Gary, Indiana, discussed "Light Wire Differential Forces in the Treatment of Dental Malocclusions," and Samuel Ackerman of Cincinnati, Ohio, spoke on "The Edgewise Appliance as Used With Extraoral Therapy."

On Tuesday evening the President's Reception and Ball offered a welcome diversion after two full days of scientific sessions. George Harris presided with his usual finessé, and the dinner, the entertainment, and the dancing were enjoyed by all present.

On Wednesday morning, at a session presided over by Lewis Pinney, Joseph Jarabak presented a continuation of the subject that he had opened on Tuesday afternoon. Cecil Steiner then concluded the discussion that he had begun on Monday and Tuesday.

After the final business session, the meeting was adjourned.

A wealth of scientific material was presented by the essayists at the meeting in Cincinnati. If only it could be absorbed for mental filing, ready to be called into use in our workaday world! We thank all of the speakers for their generosity.

Henry D. Cossitt, Editor.

American Dental Association

MEETING WITH RIBICOFF HELD*

Representatives of the Association met Thursday morning in Washington, D. C., with Gov. Abraham A. Ribicoff of Connecticut, Secretary-designate of Health, Education and Welfare. On hand for ADA were Pres. Charles H. Patton, Sec. Harold Hillenbrand and Bernard J. Conway, assistant secretary for legal affairs. No report on the conference was available as this issue of *ADA News Letter* went to press. But it was expected that discussions centered around development of federal programs designed to improve the dental health of the public. Meanwhile, leaders of American Medical Association are reported to have pledged their cooperation to Governor Ribicoff. Dr. E. Vincent Askey of Los Angeles, president, and three other AMA officials conferred with the governor for an hour and a half Jan. 6 in New York. The subject of health care for the aged marked the discussion. Dr. Askey and his associates told the governor they were "ready and willing" to assist in implementing the Kerr-Mills Medical Aid to the Aged Act, passed at the last session of Congress.

ASSOCIATION TELLS POSITION*

The ADA announced its position on Monday, Jan. 9, reaffirming "opposition to the inclusion of health benefits within the OASDI provisions of the Social Security Act." Said Pres. Charles H. Patton:

"We believe there are other methods which will be more effective in meeting the health care problems of the aged. We do not, however, question the motives of those who differ from us, and we believe our views are entitled to the same consideration. . . ."

PATTON URGES SCIENCE FAIR ACTIVITY†

Pres. Charles H. Patton has urged state and local dental societies to begin immediately to take part in science fair programs. "In addition to offering dental societies readymade

*From the *ADA News Letter*, Jan. 15, 1961.
†From the *ADA News Letter*, Feb. 1, 1961.

possibilities for improving public relations, science fairs provide an important medium for stimulating interest on the part of outstanding students in pursuing dental careers,'' Dr. Patton said. Science Fair Kits have been sent to all constituent and component societies. Individual kits may be obtained on request from the Council on Dental Research at the ADA Central Office. The national fair will be held May 10-13 in Kansas City; preliminary fairs usually are held from February through April. ''It is essential that dental society programs proceed without delay,'' Dr. Patton said.

FOUNDATION REPORTS DENTAL GRANTS*

The W. K. Kellogg Foundation paid out $319,000 in grants to dental schools, societies and institutions during 1960, according to the Foundation's annual report. Among dental programs supported by the Foundation were the survey of dentistry, development of teacher-training, dental hygiene testing and education, placement of new dental practitioners, and continuing education of dentists. In commenting on the state of dentistry, 1960, the report noted attempts by some laboratory technicians in Canada and the United States to obtain legal sanction for dealing directly with the public. Such proposals, the report said, ''constitute a very serious challenge to the dental profession and a real threat to the high standard of quality that has caused American dentistry to be generally recognized as pre-eminent throughout the world.''

Puerto Rico Orthodontists Association

Formal announcement is made of the formation of the Puerto Rico Orthodontists Association. The officers are as follows:

President, Lemuel de Jesús
Vice-President, Jaime de Jesús
Secretary, Luis Toro
Treasurer, Virgilio Fossas
Director, Raúl Acevedo

Joint Council to Improve the Health Care of the Aged

An expanded program of activity on the local level was announced on Jan. 24, 1961, by the Joint Council to Improve the Health Care of the Aged as it announced officers for 1961.

Dr. Charles H. Patton of Philadelphia, president of the American Dental Association, has been elected chairman of the Joint Council for the year. Dr. Patton's election was announced by Howard I. Wells, Jr., executive secretary of the Joint Council, who has been re-elected secretary-treasurer. The new chairman will preside for the first time at a meeting of officers and directors of the Joint Council in Chicago on March 8. He succeeds Ray E. Brown of Chicago, a past president of the American Hospital Association.

Dr. Leonard W. Larson of Bismarck, North Dakota, president-elect of the American Medical Association, is the new vice-chairman of the Joint Council. He succeeds Dr. Paul H. Jeserich of Ann Arbor, Michigan, immediate past president of the American Dental Association.

Outlining the Joint Council's program for the year, Wells said that local persons in the health professions will be urged to assess the health needs of the elderly in their particular regions. Among groups that will receive particular attention in local surveys are the institutionalized and homebound chronically ill and aged.

The Joint Council was formed in 1958 under joint sponsorship of the American Dental Association, the American Hospital Association, the American Medical Association, and the

*From the *ADA News Letter,* Feb. 1, 1961.

American Nursing Home Association. Wells said that current objectives of the Joint Council are twofold:

To correlate the efforts and resources of member organizations as the principal purveyors of health care for the aged.

To establish liaison and a cooperative relationship with other organizations working in the area.

Columbia University

The School of Dental and Oral Surgery of Columbia University announces the following courses for qualified orthodontists:

Twin-wire Appliance Therapy. Dec. 4 to 8, 1961. Joseph E. Johnson and associates.

Edgewise Appliance Therapy. March 5 to 10, 1962. Clifford L. Whitman and associates.

Applied Roentgenographic Cephalometry. March 14 to 16, 1962. Henry I. Nahoum.

Preventive Orthodontics. July 10 to 14, 1961. Nicholas A. Di Salvo, Walter G. Spengeman, and staff.

Death of Henry Westhoff

Henry F. Westhoff of St. Louis, former vice-president of the American Dental Association, died on Jan. 23, 1961. Dr. Westhoff served as general chairman of the general committee on local arrangements for the 1952 annual session of the ADA in St. Louis, and he was a long-time member of the American Association of Orthodontists.

Notes of Interest

L. Floyd Heier, D.D.S., 4011 St. Claude Ave., New Orleans, Louisiana, announces the limiting of his practice to orthodontics.

Arthur C. Reed, D.D.S., announces the opening of his office for the practice of orthodontics at 7948 Long Point Rd., Houston, Texas.

Sydney Schwitz, D.D.S., announces that his practice at 1228 Wantagh Ave., Wantagh, New York, is limited to orthodontics.

Abraham Silverstein, B.S.D., D.D.S., M.S., announces the removal of his office for the exclusive practice of orthodontics from 2070 Grand Concourse, Bronx, New York, to 3925 Henry Hudson Parkway West, Riverdale, New York.

Forthcoming meetings of the American Association of Orthodontists:

1961—Denver Hilton Hotel, Denver, Colorado, April 16 to 21.
1962—Statler Hotel, Los Angeles, California, April 28 to May 3.
1963—Hotel Fontainebleau, Miami Beach, Florida, May 5 to 9.
1964—Palmer House, Chicago, Illinois, May 10 to 14.
1965—Dallas Statler-Hilton, Dallas, Texas, April 25 to 30.

OFFICERS OF ORTHODONTIC SOCIETIES*

The AMERICAN JOURNAL OF ORTHODONTICS is the official publication of the American Association of Orthodontists and its component societies. The Editorial Board of the JOURNAL is composed of a representative of each of the component societies.

American Association of Orthodontists

(Next meeting April 16-21, 1961, Denver)

President, William R. Humphrey - - - - - - - - - Republic Bldg., Denver, Colo.
President-Elect, Dallas R. McCauley - - - - - - 410 S. Beverly Dr., Beverly Hills, Calif.
Vice-President, Cecil G. Muller - - - - - - - - 101 S. 35th Ave., Omaha, Neb.
Secretary-Treasurer, Earl E. Shepard - - - - - - - 225 South Meramec, Clayton, Mo.

Central Section of the American Association of Orthodontists

(Next meeting Oct. 1-3, 1961, Minneapolis)

President, Henry E. Colby - - - - - - - 1850 Medical Arts Bldg., Minneapolis, Minn.
Secretary-Treasurer, Kenneth E. Holland - - - - - - 1016 Sharp Bldg., Lincoln, Neb.
Director, G. Hewett Williams - - - - - - - - - - - 811 Elm St., Winnetka, Ill.

Great Lakes Society of Orthodontists

President, Hunter I. Miller - - - - - - - - - - - 1416 Mott Foundation Bldg., Flint, Mich.
Secretary, Edward A. Cheney - - - - - - - - - - 1201 Bank of Lansing Bldg., Lansing, Mich.
Director, Harlow L. Shehan - - - - - - 601 Jackson City Bank Bldg., Jackson, Mich.

Middle Atlantic Society of Orthodontists

(Next meeting Oct. 1-3, 1961, Atlantic City)

President, Paul V. Reid - - - - - - - - - - Medical Arts Bldg., Philadelphia, Pa.
Secretary-Treasurer, Charles S. Jonas - - - - - - Mayfair Apts., Atlantic City, N. J.
Director, Louis E. Yerkes - - - - - - - - - - - 825 Linden Ave., Allentown, Pa.

Northeastern Society of Orthodontists

President, Henry C. Beebe - - - - - - - - - 60 Charlesgate West, Boston, Mass.
Secretary-Treasurer, David Mossberg - - - - - - 36 Central Park S., New York, N. Y.
Director, Norman J. Hillyer - - - - - - - - 230 Hilton Ave., Hempstead, L. I., N. Y.

Pacific Coast Society of Orthodontists

(Next meeting Aug. 6-10, 1961, Seattle)

President, E. Allen Bishop - - - - - - - - - - 703 Cobb Bldg., Seattle, Wash.
Secretary-Treasurer, Warren A. Kitchen - - - - 2037 Irving St., San Francisco, Calif.
Director, William S. Smith - - - - - - - - - - 2530 Bissell Ave., Richmond, Calif.

Rocky Mountain Society of Orthodontists

President, H. C. Pollock, Jr. - - - - - - - - - 915 S. Colorado Blvd., Denver, Colo.
Secretary-Treasurer, Hubert J. Bell, Jr. - - - - - - 8790 W. Colfax, Lakewood, Colo.
Director, Ernest T. Klein - - - - - - - - - - 707 Republic Bldg., Denver, Colo.

Southern Society of Orthodontists

(Next meeting Nov. 5-8, 1961, St. Petersburg)

President, Charles E. Harrison - - - - - - - - - - 362 Sixth St., S., St. Petersburg, Fla.
Secretary-Treasurer, William H. Oliver - - - - - - - 1915 Broadway, Nashville, Tenn.
Director, Boyd W. Tarpley - - - - - - - 2118 Fourteenth Ave., S., Birmingham, Ala.

Southwestern Society of Orthodontists

President, Bibb Ballard - - - - - - - - - - - - 7713 Inwood Rd., Dallas, Texas
Secretary-Treasurer, Tom M. Matthews - - - - - - 8215 Westchester Dr., Dallas, Texas
Director, Nathan Gaston - - - - - - - - - - - 701 Walnut St., Monroe, La.

American Board of Orthodontics

(Next meeting April 10-15, 1961, Denver)

President, Wendell L. Wylie - - - - - University of California School of Dentistry, San Francisco, Calif.
Vice-President, J. A. Salzmann - - - - - - - - 654 Madison Ave., New York, N. Y.
Secretary, Alton W. Moore - - University of Washington School of Dentistry, Seattle, Wash.
Treasurer, Paul V. Reid - - - - - - - - 1501 Medical Arts Bldg., Philadelphia, Pa.
Historian, B. F. Dewel - - - - - - - - - - - - 708 Church St., Evanston, Ill.
Director, Frank P. Bowyer - - - - - - - - 608 Medical Arts Bldg., Knoxville, Tenn.
Director, Nathan G. Gaston - - - - - - - - - - - 701 Walnut St., Monroe, La.

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*In order to keep this list up to date, the editor depends on the various sectional editors to notify him immediately of changes in officer personnel.

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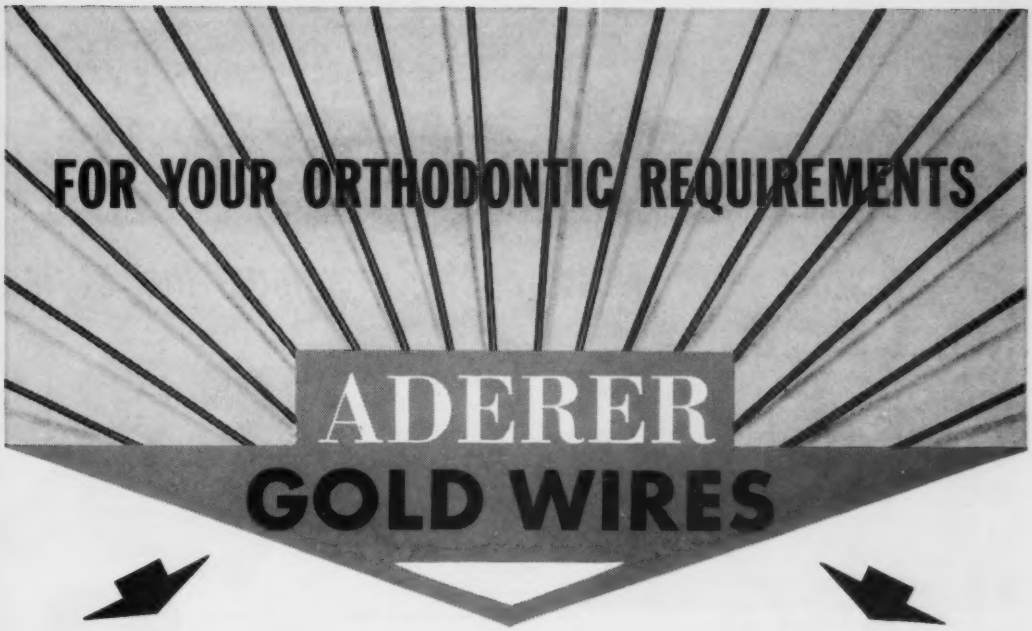

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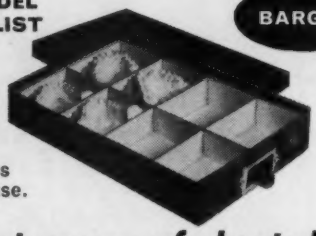

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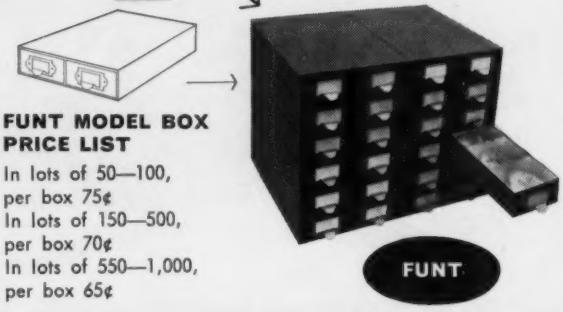

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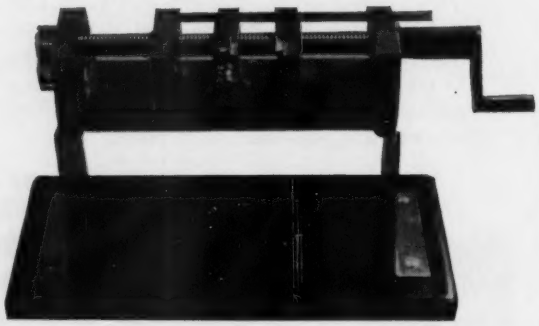

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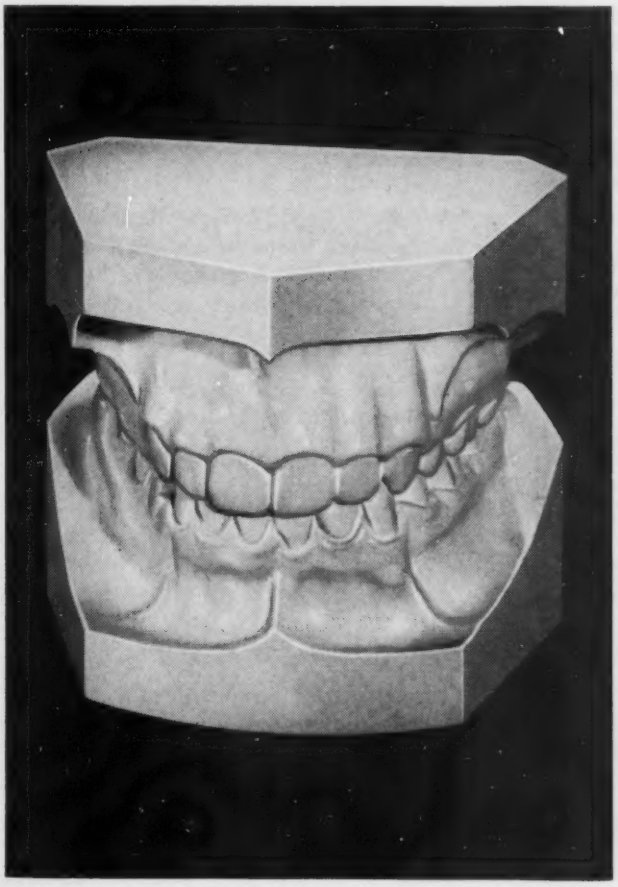

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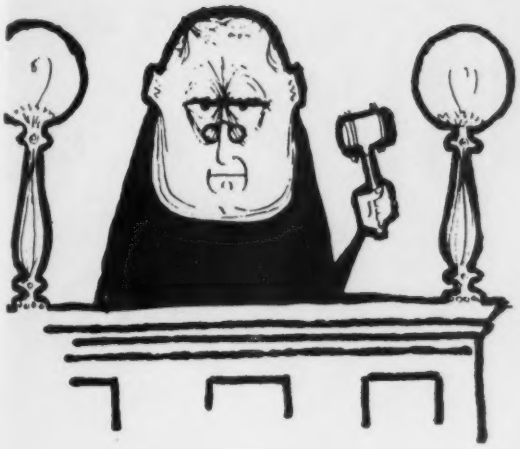

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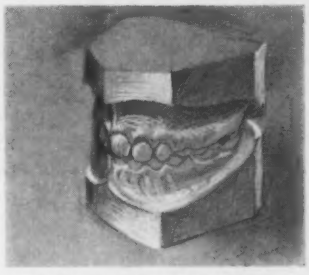

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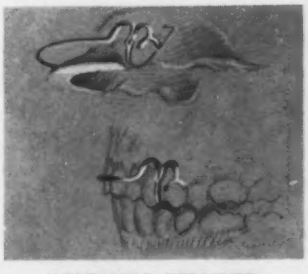

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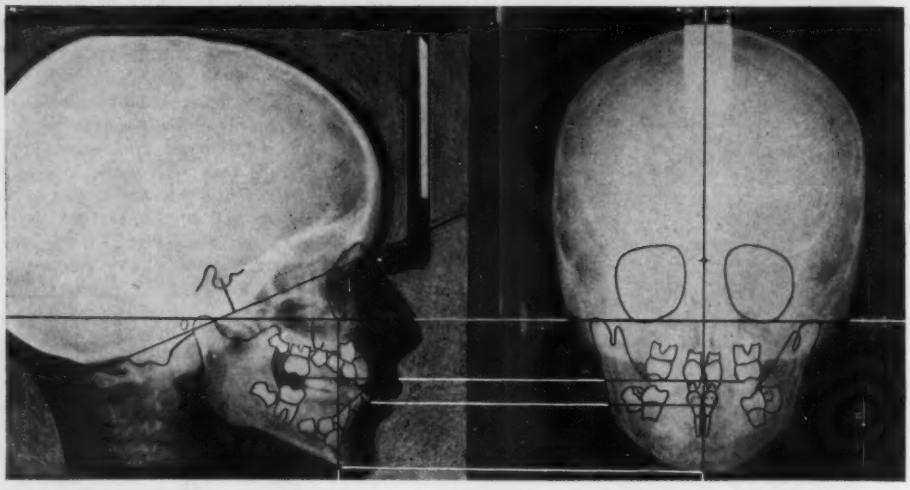

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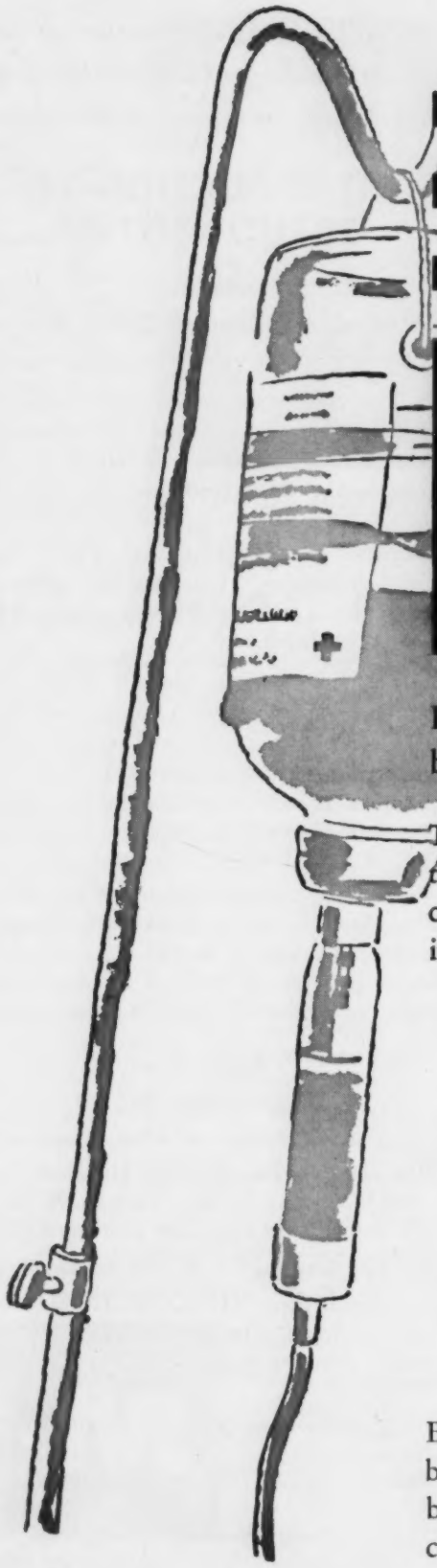

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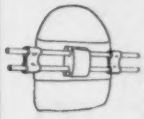

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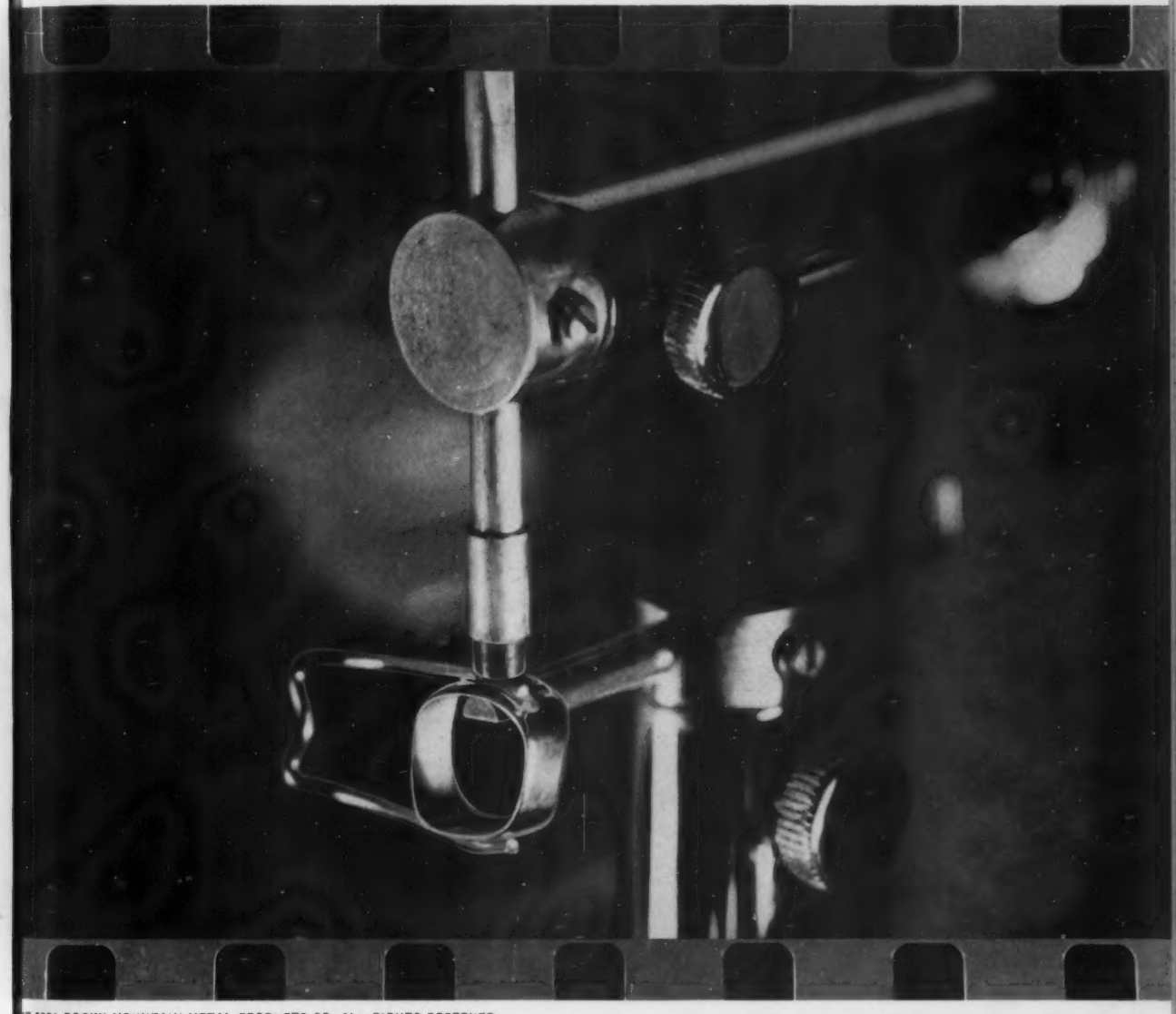

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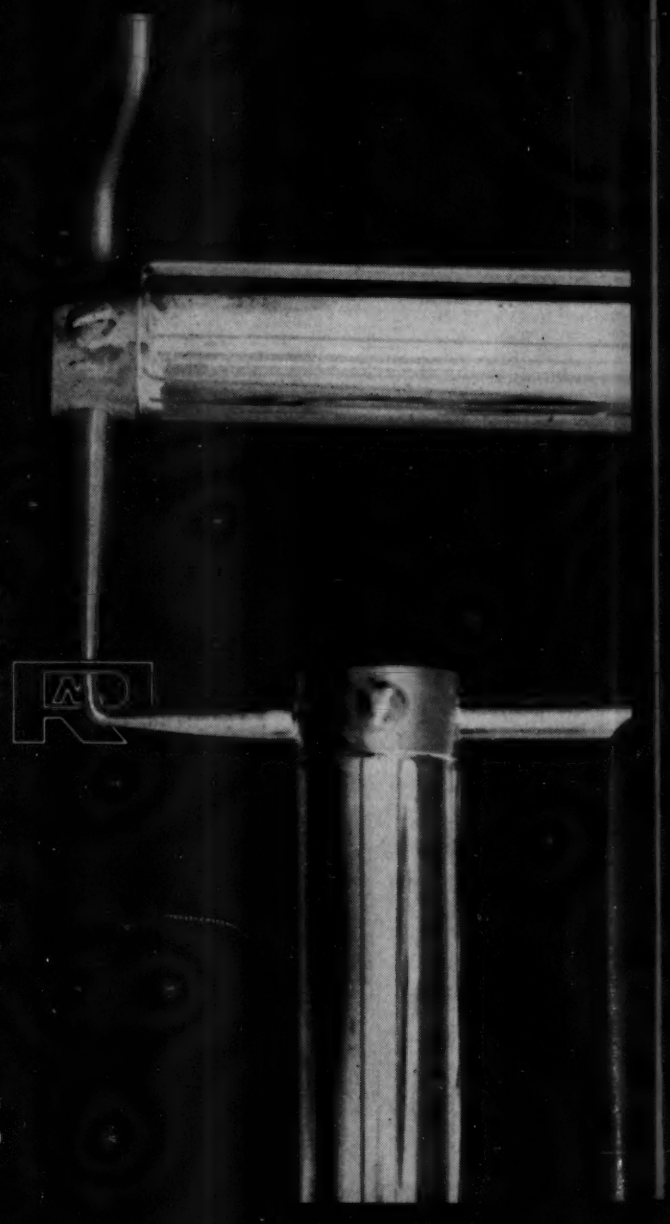

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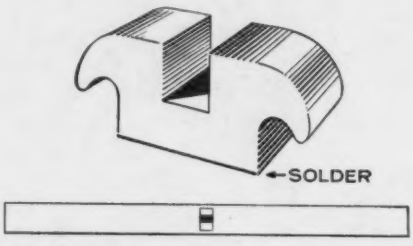
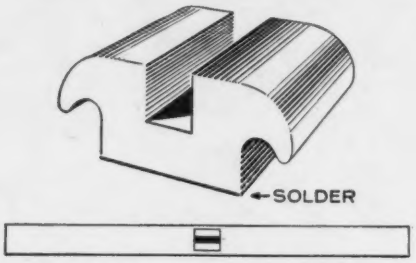
won't discolor in the mouth! can be used repeatedly!

S.S.White Edgewise Brackets

Anterior .050″ wide M 452S



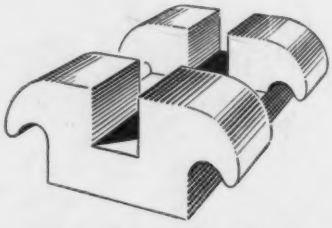
Posterior .100″ wide M 452AS



Pre-soldered Metalba* Edgewise Brackets are strong; remain clean in the mouth; can be soldered to; can be used on precious metal or Stainless Steel bands; and, used over and over again.

Divided Triple-width Edgewise Brackets

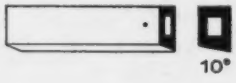
M 455



A convenient bracket for rotations as it provides two anchor points for ligatures. Supplied without solder to permit slight bending if required.

Anchor Tubes

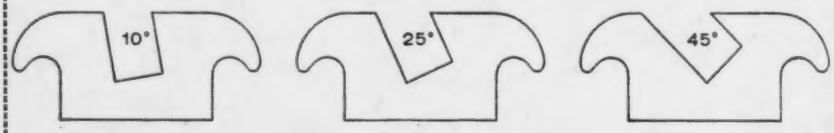
M 474



Metalba* Anchor Tubes for use in connection with Torque Slot Edgewise Brackets. They are ¼ inch long, rectangular tubes, with a bore of .022 x .028. The side of the tube which is to be soldered to the band has a 10 degree angle to permit it to fit into the Torque Slot Bracket assembly.

*METALBA—platinum color, precious metal.

Torque slot, Divided Triple-width Edgewise Brackets



The angle of the wire slot in the Bracket gives direction to the Torque force of arch wire.

M 516	Torque 10°	Width	.140 inches
M 517	Torque 10°	Width	.180 inches
M 518	Torque 25°	Width	.180 inches
M 519	Torque 45°	Width	.180 inches

METALBA
S.S.WHITE

THE S. S. WHITE DENTAL MANUFACTURING CO.

PHILADELPHIA 5, PA.